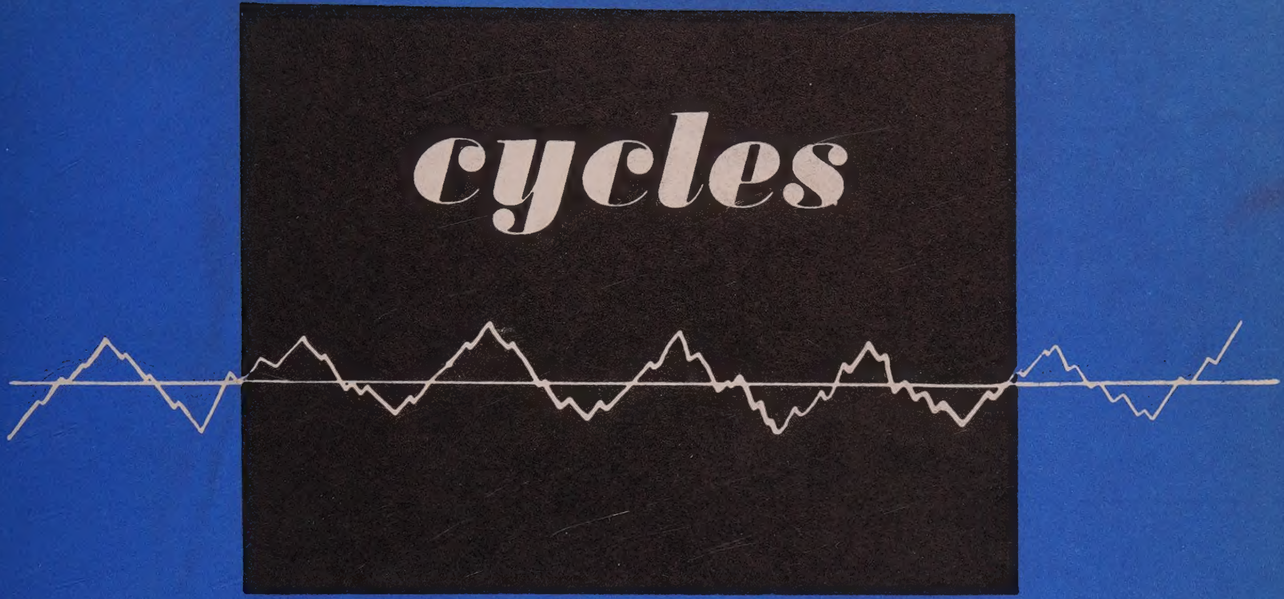

cycles

December 1955

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

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cycles

VOLUME VI NUMBER 10 DECEMBER 1955

The official Bulletin of the Foundation for the Study of Cycles

The Director's Letter

Dear Member:

The 1955 Postscript

I have promised you a 1955 Postscript to the book *Cycles—The Science of Prediction* which Mr. Dakin and I wrote in 1944. The Postscript is too long to be printed in one report. This issue contains the section on growth. The section on cycles will follow.

The Membership Plan

The membership plan is rolling right along.

At the beginning of the year we had 4,253 members. At the beginning of November we had 5,385 members. We are *hoping* that by January 1, 1956 we will have close to 5,800.

The Correspondence Course

There are 65 persons taking the correspondence course. Some have almost finished. Some have just started.

I am quite pleased with the way the students are taking hold. One or two find the going hard, but all the rest are doing splendidly. The work of some of the students is brilliant.

The Free Correspondence Course

The free correspondence course was awarded to Richard Nelson of Tampa, Florida. Mr. Nelson is a young man who is making the study of cycles his life work.

I am sorry we are not able to give more free courses, but we simply cannot afford to. On the average it takes my assistant from an hour and a half to two hours to check and correct each returned lesson. I spend a varying amount of time on each returned lesson in addition. It is really quite a chore.

The Fellowship

Money has been secured to extend Dr. Wing's Fellowship for an additional year. Dr. Wing, you will remember, is the man who showed that the turning points of at least certain cycles come later and later as the cycle is found closer and closer to the equator. He has also discovered that this latitudinal shift, as it is called, seems to be distorted by land masses, like the declination of terrestrial magnetism.

Stock Market Forecast

The following letter regarding my stock market forecast of 1944 and my reply to it may be of general interest:

Dear Mr. Dewey:

Would you care to comment on the apparent wide divergence of the actual rise to date in the Standard & Poor's average to over 290, assuming we have seen the highs and lows for 1955, as compared with a prognosticated peak of approximately 150? It would appear that one would have to go back to the late 1870's to find such a wide proportionate divergence.

Dear Mr. T....:

You are right there is at the present time a wide divergence between the level of my stock market forecast of 1944 and the Standard & Poor's Corporation Combined Index upon which it was based.

Although there is a wide divergence of levels, the timing has been pretty good. And it is timing in which all of us are chiefly interested.

This is in large part a matter of luck. Cycles as long as 4 years cannot possibly be expected to pin point to the year the various annual wiggles of a series of figures.

The forecast of 1944 called for a crest at 1954 and a coming trough at 1960. Looking backwards from the vantage point of *circa* 1970, if 1955 or even 1956 should prove to be the year of crest, and if anywhere near 1960 should prove to be the year of trough, the forecast will have been noteworthy.

My purpose in making this forecast was not to outguess the market nor to provide a practical method of trading, but rather to provide additional proof that cycles do keep on coming true after discovery, and hence that they cannot be attributed solely to chance. I think my point has already been pretty well made. And if, by good fortune, a theoretical short sale at the average price of 1954 can be covered at a profit at the average price of 1960 I will have made my point still further.

Now getting into the matter of divergence: I do not know the reason for the divergence and I am not very good at making alibis. However, here are a few random thoughts.

The divergence between 1943 and 1953 can be explained almost entirely by adjusting either the forecast or stock prices for the change in the gold value of our paper currency. I do not, however, believe that this is the explanation. (1) We had paper currency in Civil War times without any apparent distortion of stock market prices, (2) Our paper currency has been off gold since 1933. If being off gold were the cause of the discrepancy, it should have caused a distortion from 1933 to 1944, but it did not seem to. (3) The additional divergence between the forecast and the actuals for 1954 and 1955 cannot be accounted for this way because there has been no additional watering of our currency for these years.

A more likely reason for the divergence is the failure of the study of 1944 to isolate all of the cycles that are inherent in the stock market figures. If, for example, the 17.2 or 17.3-year cycle reported upon in May 1955 had been included in the synthesis of 1944, the forecast would have been importantly higher than it is at the present time. However, a cycle as long as this relative to the length of the series of figures has an opportunity to repeat so few times that its inclusion as an important constituent of a forecast is very questionable. If I were to make another forecast today it would require quite a little study before I would venture to include this 17-year cycle in the synthesis and projection even though it would certainly help the correspondence between the two curves from 1830 to date,

I have noticed that cycle forecasts rather consistently have an amplitude less than the amplitude of the fluctuations from which they were derived. This may be due to an inherent irregularity of timing of the cycles themselves. As a cycle is sometimes on time, sometimes early, and sometimes late, when you try to tie it down to a particular time, you lose a great deal of its strength.

These random thoughts may throw a little light on the situation, but I suppose the real reason is that in 1944 I did not know enough to do a better job than I then did. I could perhaps do a little better today, but even today I do not know enough to make forecasts as accurate in timing and in levels as I would wish.

Cordially yours,

Edward R. Dewey

Director

THE 1955 POSTSCRIPT

TO

CYCLES-THE SCIENCE OF PREDICTION

INTRODUCTION

THE book *Cycles—the Science of Prediction,* which was written by Mr. E. F. Dakin and myself in 1944, presented two facts of basic importance. The first fact concerned growth. The book showed that social and economic organisms (nations and manufacturing companies, for instance) follow a basic law of growth just as definitely as do trees, pumpkins, and rabbits. The second fact concerned cycles. The book showed that many aspects of social and economic life fluctuate in rhythmic cycles, some of which are too regular and have repeated too many times to be easily the result of chance. We need to take both of these facts into account in our effort to appraise the future.

Let me take a few words to elaborate each of the two points raised above.

Growth

Speaking first of growth: Trees do not grow to reach the sky. According to their nature they grow to 20, to 50, to 100, or to 200 feet, but there are limits beyond which any given kind of tree can not grow. Pumpkins may grow to be as big as a wheelbarrow, but they do not and cannot grow to be as big as a house. Rabbits grow to be 6 feet high only on the stage. There are no Harveys running around in my back yard nor in yours. The law holds true for *everything* within the universe (except perhaps the universe itself, as to which matter no one knows). Wishful thinking will not change this basic law of nature. The economy of the United States, despite the current spurt, is no exception to the general rule. Our basic underlying growth trend is still upward, but very definitely the underlying growth trend is not increasing at as fast a rate as it used to. An even slower rate of increase in the future can be forecast with *certainty.*

The law of growth is this: As we progress in time—as things get older—things grow at a slower *rate.*

Cycles

And now a word about the cycles which have repeated time after time with so much regularity. There can be no argument about the fact that ups and downs in economic affairs have come at reasonably regular time intervals for as far back as there are figures. There is, however, argument in regard to the statistical significance of this regularity. There are those who believe that all of this regularity is merely random. Others believe that to ascribe all of this regularity to random influences is unreasonable—even fantastic. The *reality* of the cycle can not be questioned. The *significance* (or lack of it) of any given cycle is a matter of *belief.*

It is unfortunate that this matter of

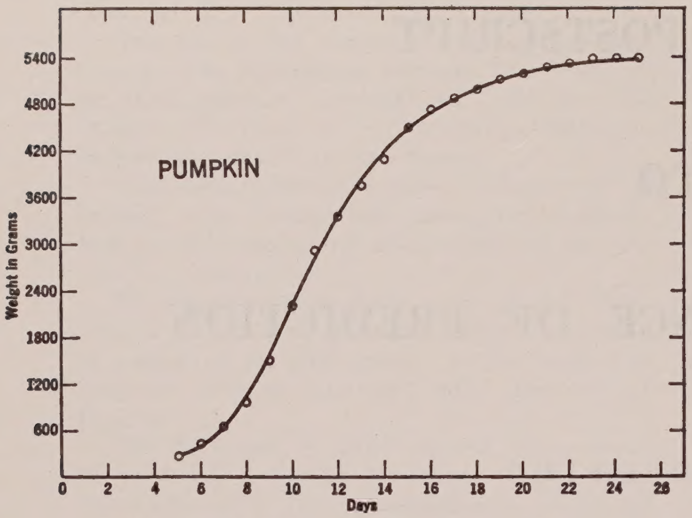


FIG. 1. GROWTH IN WEIGHT OF A PUMPKIN (AFTER PEARL)

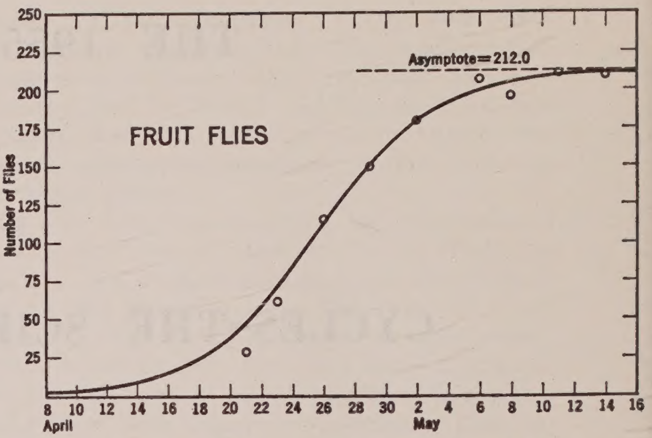


FIG. 4. GROWTH OF A POPULATION OF FRUIT FLIES IN A BOTTLE (AFTER PEARL)

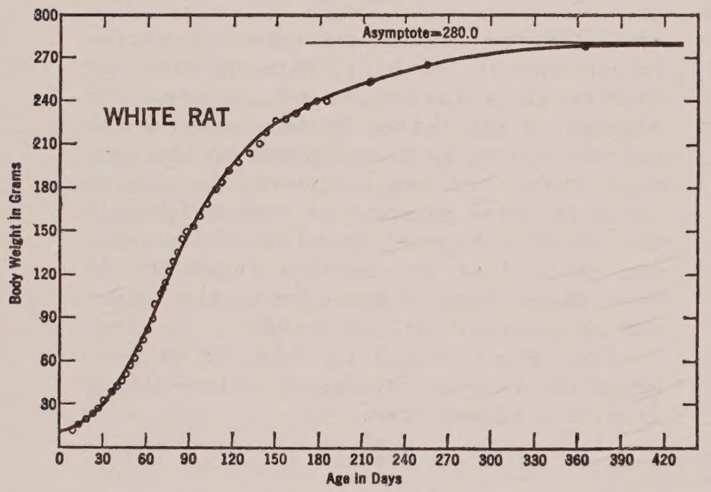


FIG. 2. GROWTH IN BODY WEIGHT OF A MALE WHITE RAT (AFTER PEARL)

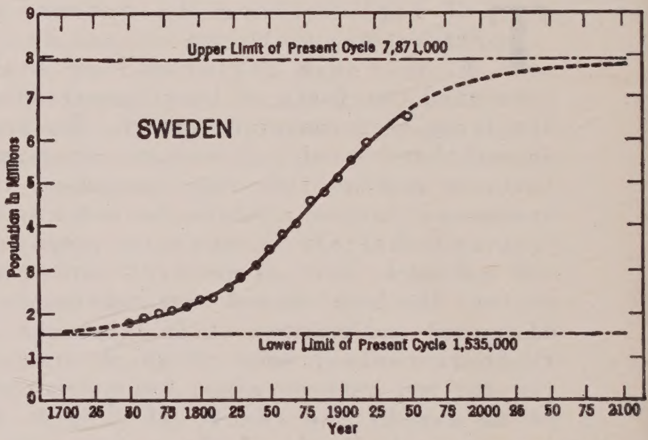


FIG. 5. GROWTH OF THE POPULATION OF SWEDEN (AFTER PEARL)

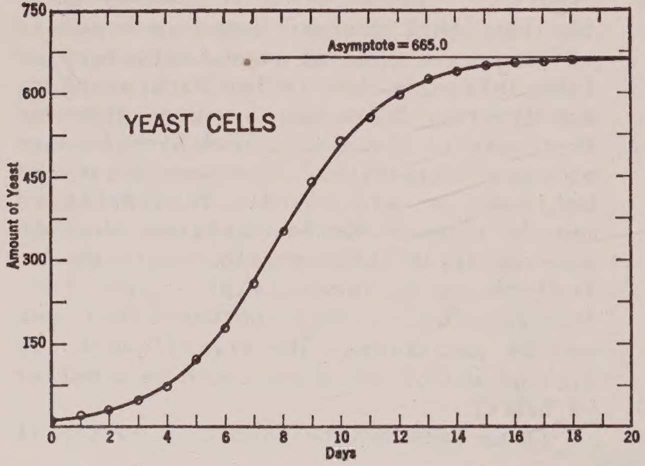


FIG. 3. GROWTH OF A POPULATION OF YEAST CELLS (AFTER PEARL)

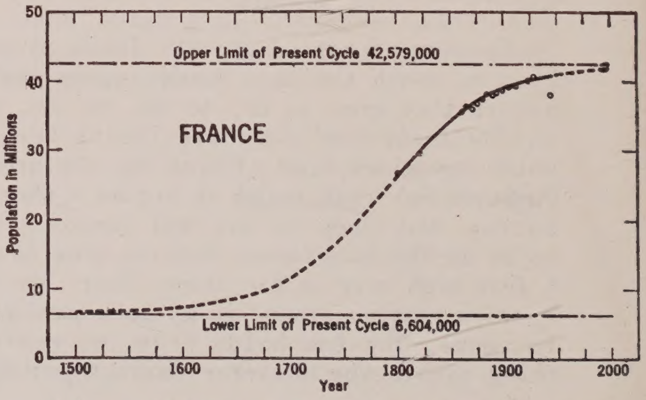


FIG. 6. GROWTH OF THE POPULATION OF FRANCE (AFTER PEARL)

PLATE I

significance lies in the realm of *belief*. It should be in the realm of *knowledge*. However, no statistician has yet worked out a generally accepted way to evaluate the significance of the sort of rhythmic cycles we find in economic figures. Until some statistician succeeds in doing this, our evaluation of the significance of any particular rhythmic cycle—or of rhythmic cycles collectively—will have to rest upon common sense.

Chance

Of course, anything *could* happen as a result of chance. If you set a monkey in front of a typewriter, there is one chance in 43 (the number of keys on a machine) that the first letter he would strike would be T. Every time he strikes a T there is again one chance in 43 that the next letter he strikes will be H. Once in 43 times, on the average, one of these combinations of TH will be followed by an E. Having produced the THE, once in 43 times on the average the next key he hits will be a space. Presently, with a few billion monkeys pounding a few billion typewriters for a few billion years, one monkey might come up, purely by chance, with the letters: THE BOOK CYCLES—THE SCIENCE OF PREDICTION, WHICH WAS WRITTEN BY MR. E. F. DAKIN AND MYSELF IN 1944 PRESENTED TWO FACTS OF BASIC IMPORTANCE... This *could* happen, but I assure you that this particular article was not written in that way. I hope to convince you that at least some of the regularities in business can not reasonably be the result of chance, either.

A Statement

And now I wish to make a statement of critical importance: If the *regularity* of the ups and downs of *any* series of figures has a cause, and if that cause, and the regularity it produces, are not taken into account by those who study such figures, the knowledge of such people is only partical and their forecasts can not be depended upon.

For example, if there are such things as tides, the people who study oceans will not know enough about their subject and will not be able to make adequate forecasts of future water levels unless they take the tides into account. Similarly, if there are such things as significant rhythmic cycles in economic data and any economists fail to take them into account, he will not know enough about his subject and will not be able to make adequate forecasts of future prices and of future production.

With these preliminary remarks out of the way, let us now get down to details, first in regard to growth and then, in a later article, in regard to cycles.

PART I GROWTH

As a rule, things grow slowly, then fast, then slowly. This fact is illustrated in Plate I below.

It matters not whether we record the growth of a pumpkin (Fig. 1), a white rat (Fig. 2), a group of yeast cells (Fig. 3), a group of fruit flies (Fig. 4), a group of Sweedes (Fig. 5), or a group of Frenchmen (Fig. 6)—all behave the same way.

Plate II gives further examples of growth. Fig. 1 shows the growth of the indigenous native population of Algeria as stimulated by open French control, following conquest. Fig. 2 shows the growth of the population of the United States. The main characteristics are always the same—an elongated letter ∫.

Fig. 3 of Plate II charts the growth of Germany from 1700. Here we see something new—a rebirth which began about 1850, and which superimposed a new growth curve on top of the old one. Compound growth curves of this sort occasionally occur, but they are rare.

A Typical Growth Curve

A more or less typical growth curve is charted by itself in Fig. 4 and, with a cycle wrapped around it, as in Fig. 5. It is clear that the older the curve and the

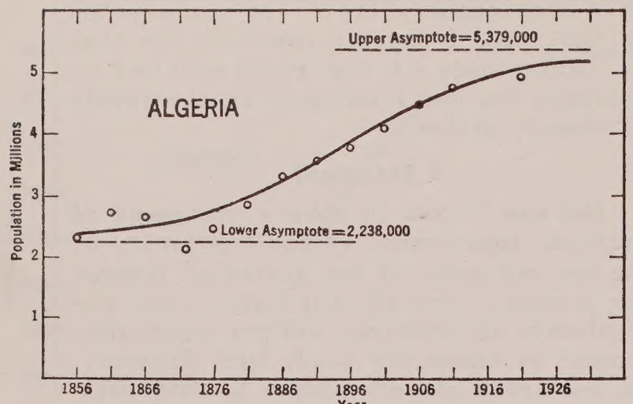


FIG. 1. GROWTH OF THE INDIGENOUS NATIVE POPULATION OF ALGERIA (AFTER PEARL)

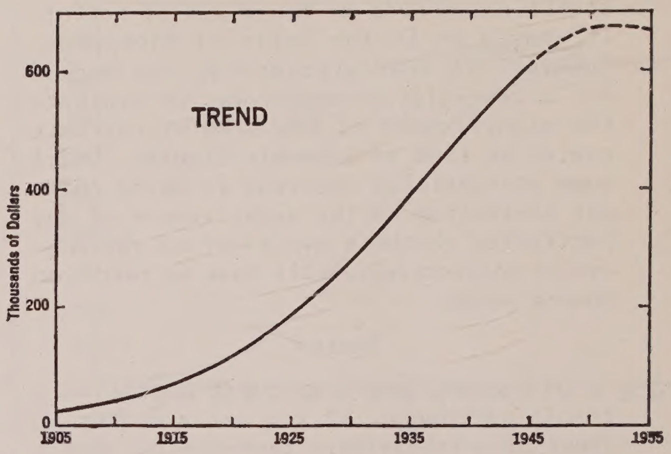


FIG. 4. IDEALIZED GROWTH TREND

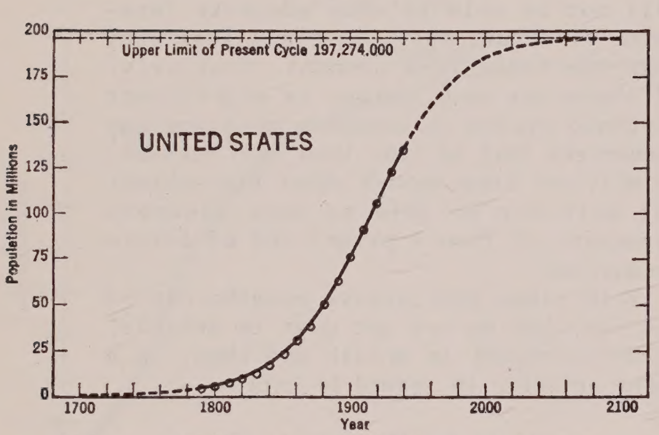


FIG. 2. GROWTH OF THE POPULATION OF THE UNITED STATES (AFTER PEARL)

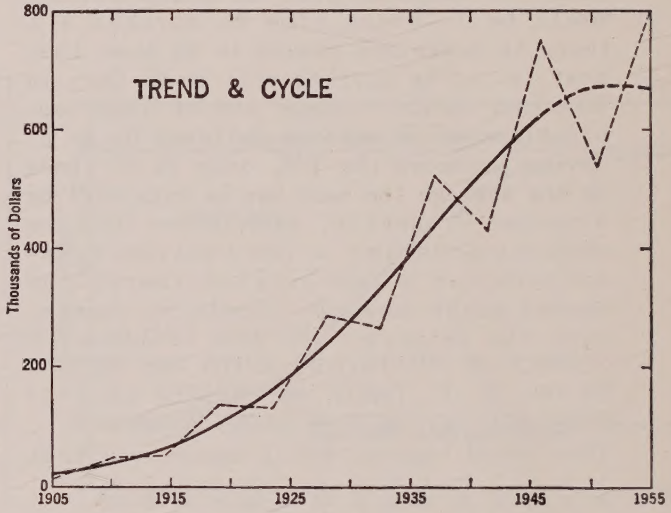


FIG. 5. IDEALIZED GROWTH TREND TOGETHER WITH AN IDEALIZED 9-YEAR CYCLE

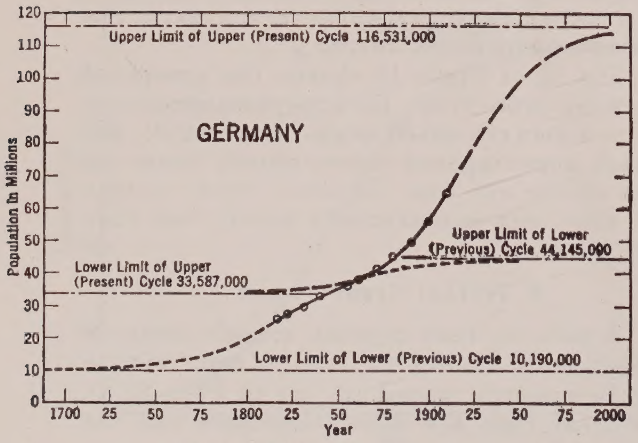


FIG. 3. GROWTH OF THE POPULATION OF GERMANY NOTE REBIRTH WHICH OCCURRED ABOUT 1860 AND THE COMPOUND GROWTH CURVE WHICH RESULTED.

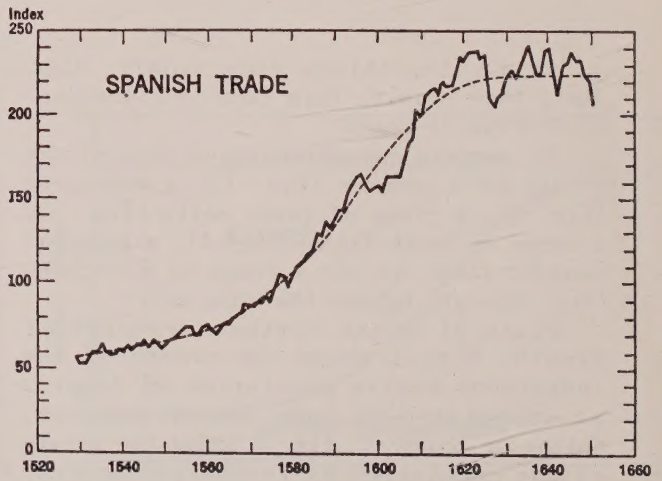


FIG. 6. INDEX OF SPANISH TRADE 1530—1650 (AFTER DAVIS AND HAMILTON)

PLATE II

higher the level, the bigger are the ups and downs of the cycle.

The final curve of Plate II, (Fig. 6), an index of Spanish trade, 1530—1650, illustrates that economic data, too, conform to typical growth patterns. Note that, as in Fig. 5, the higher the growth curve the bigger the oscillations.

Although the *actual* growth of anything is likely to be small in the beginning, the *rate* of growth in the beginning is usually very large. For example, here are the values for the so-called typical growth curve shown in Fig. 4 of Plate II.

Sales of a Hypothetical Company 1905-1955

Year	Sales	5-Year Growth	
		Actual Growth	Percent Growth
1905	$ 20,000		
1910	38,000	$ 18,000	90
1915	68,000	48,000	80
1920	116,000	48,000	70
1925	186,000	70,000	60
1930	279,000	93,000	50
1935	391,000	112,000	40
1940	508,000	117,000	30
1945	609,000	101,000	20
1950	669,900	60,900	10
1955	669,900	0	0

Note that in the first five years (1905—1910) growth was only $18,000, but *rate* of growth was 90%. By 1935-40, growth was $117,000, but *rate* of growth was only 30%. From 1945 to 1950 actual growth was still $60,900, but *rate* of growth had dropped to 10%. If this pattern of 10% less growth every 5 years continued, for the particular series of figures used for illustration, 1950-1955 would show no growth at all.

Ratio Scale

As *rate* of growth usually changes more consistently than actual growth, it is customary to chart all figures involving growth on *ratio* scale. Whereas arithmetic scale is graduated in such a way that equal vertical distance represents equal *amounts* of growth, ratio scale is graduated in such a way that equal vertical distance represents equal *percentage* growth. The difference is illustrated in Plate III on which curves illustrating growth of equal *amount* (Fig. 1) and at equal *rate* (Fig. 2) are charted on both arithmetic and ratio scale. Plate III also shows the growth of the United States plotted in each of the two ways.

Plate IV gives three additional examples, each plotted on arithmetic and on ratio scale. Fig. 1 replots the idealized trend which we first met as Fig. 4 of Plate II. Fig. 1-A shows this curve replotted on ratio scale. Fig. 2 replots the trend and cycle which we met as Fig. 5 on Plate II. Fig. 2-A replots the same values on ratio scale.

Note in Plate IV, Fig. 2-A, that on ratio scale the *cycle* has a constant strength or amplitude. On arithmetic scale (Fig. 2) it does not. This is another reason for using ratio scale. It will be used in all the remaining charts of this article.

Twenty-four Industries

Plates V, VI, VII, and VIII illustrate the growth of twenty-four different economic indices. Some, like airplane production and petroleum production are still strongly upward. Some, like copper production and cotton production, have stabilized. Some, like coal production and wool production, have turned down. The overall picture, as far as manufactures are concerned, is shown by Fig. 1 of Plate V. The *rate* of growth is still strongly upward, but it is not as strong as it used to be. In the future it will not be as strong as it is now. Rates of growth *always* get less in the course of time.

The Reason for the Law of Growth

You may wonder why I speak so positively about the law of growth. A moment's reflection will show you that it is axiomatic. Supposing something doubles in size in a given period of time, let us say a year. If this rate of growth continues in two years it will be 2 x 2 or four times as big, in three years it will be 2 x 4 or eight times as big, then sixteen times as big, thirty-two times as big, etc. progressively. At the end of a few hundred years it will be as big as the earth. Soon it will be as big as the solar system, presently as big as our galaxy, etc.

This result will hold true no matter

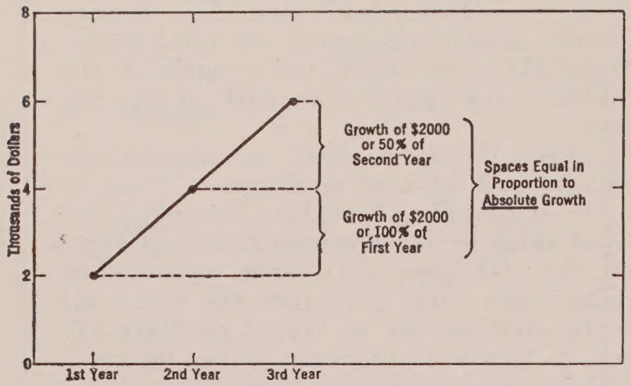


FIG. 1. EQUAL AMOUNTS OF GROWTH
ARITHMETIC SCALE

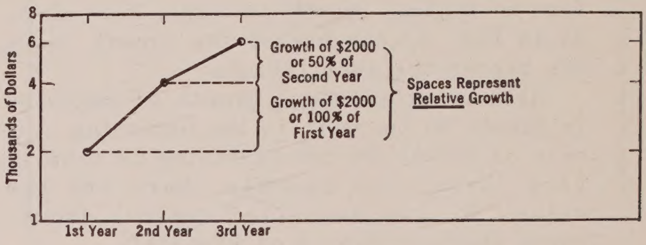


FIG. 1-A. EQUAL AMOUNT OF GROWTH
RATIO SCALE

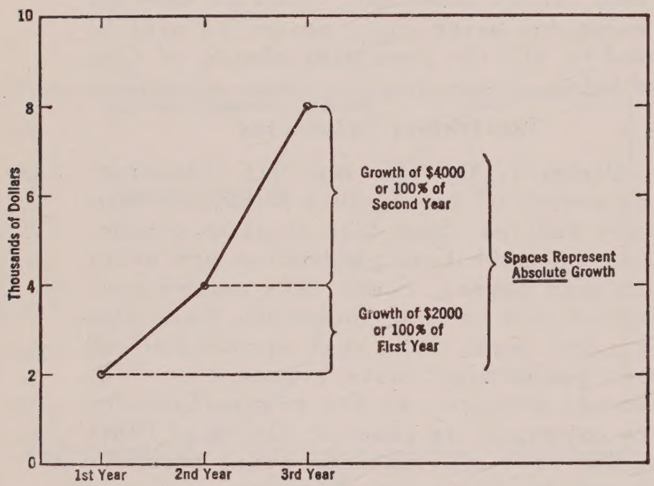


FIG. 2. EQUAL RATE OF GROWTH
ARITHMETIC SCALE

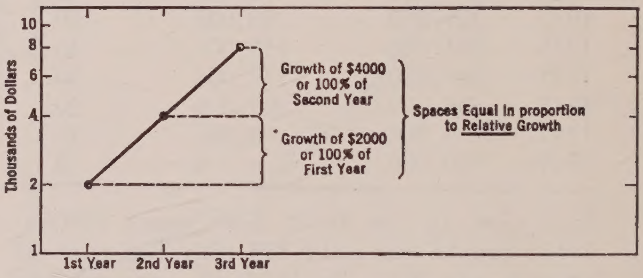


FIG. 2-A. EQUAL RATE OF GROWTH
RATIO SCALE

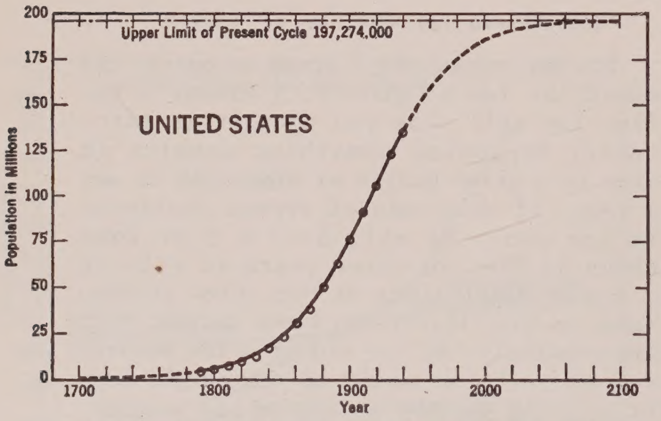


FIG. 3. GROWTH OF THE POPULATION IN THE UNITED STATES, 1700—2100 (AFTER PEARL)

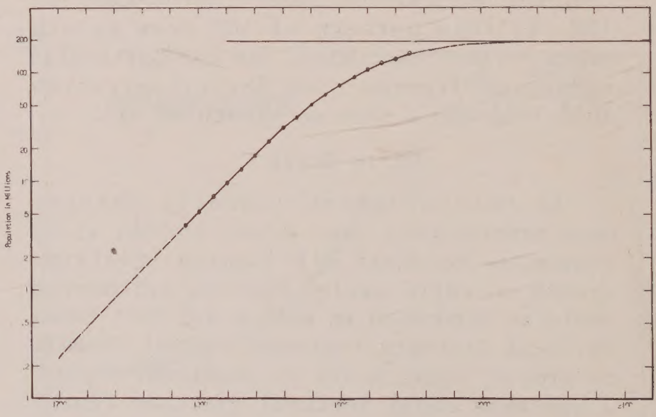


FIG. 3-A. GROWTH OF THE POPULATION OF THE UNITED STATES, 1700—2100 (AFTER PEARL)
RATIO SCALE

PLATE III

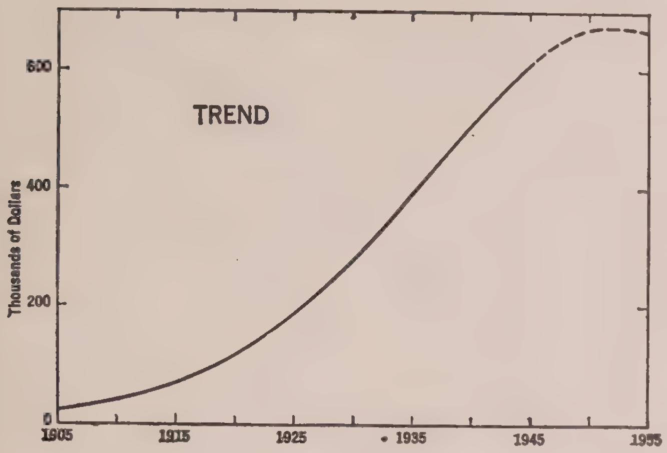


FIG. 1. IDEALIZED TREND
ARITHMETIC SCALE

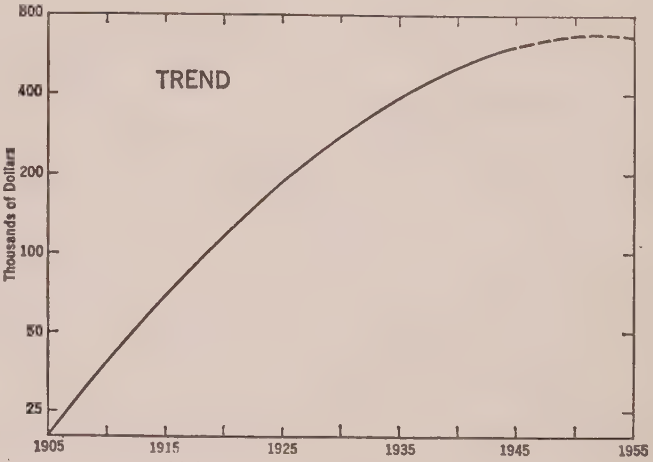


FIG. 1-A. IDEALIZED TREND
RATIO SCALE

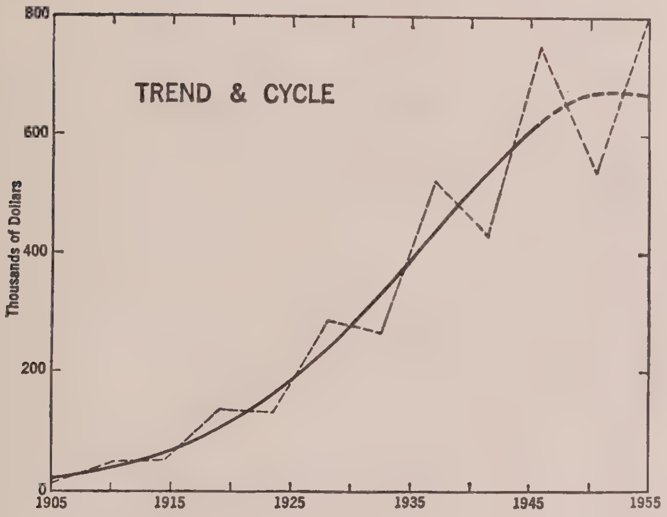


FIG. 2. IDEALIZED TREND AND CYCLE
ARITHMETIC SCALE

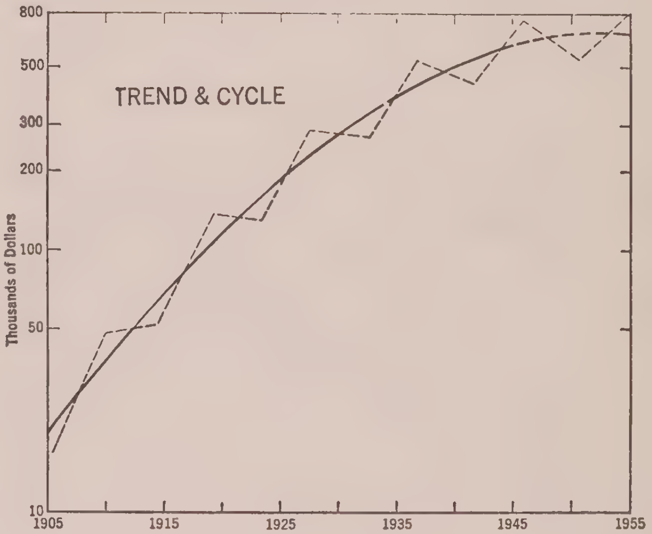


FIG. 2-A. IDEALIZED TREND AND CYCLE
RATIO SCALE

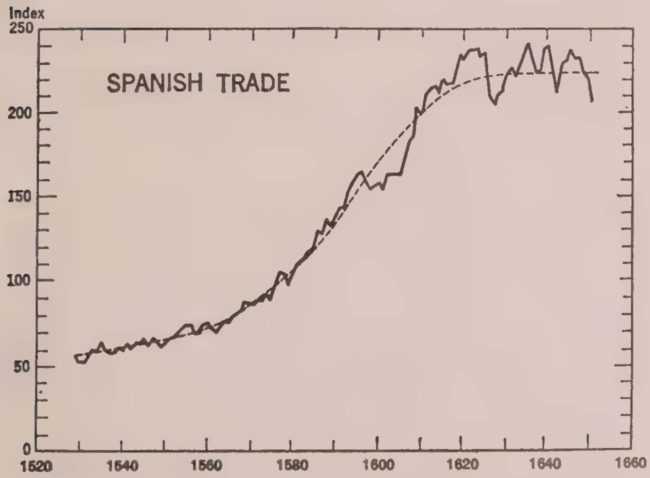


FIG. 3. INDEX OF SPANISH TRADE, 1530—1650
ARITHMETIC SCALE

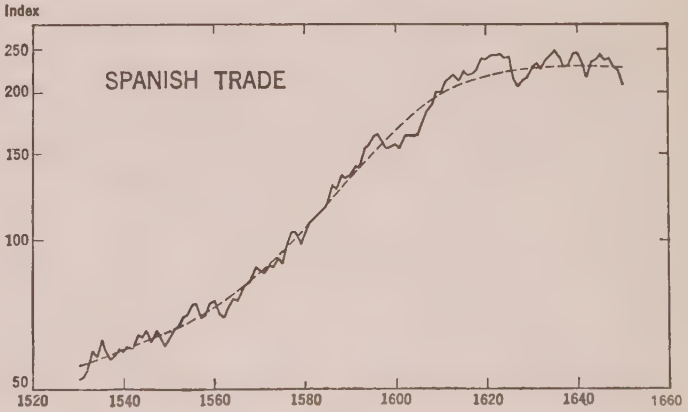


FIG. 3-A. INDEX OF SPANISH TRADE, 1530—1650
RATIO SCALE

PLATE IV

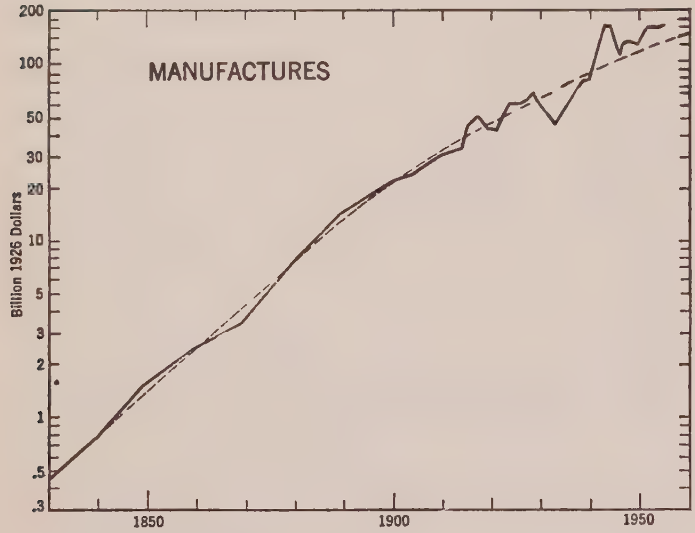


FIG. 1. MANUFACTURES, U. S. A., 1830—1955
RATIO SCALE

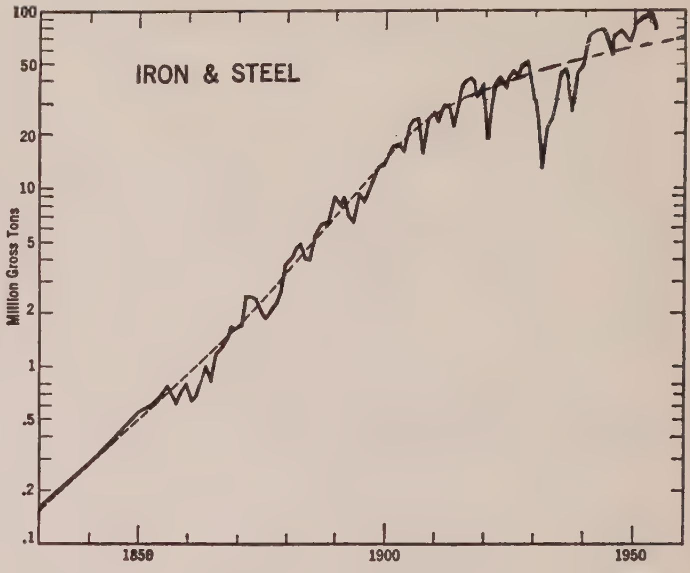


FIG. 4. IRON AND STEEL PRODUCTION, U. S. A., 1830—1954, RATIO SCALE

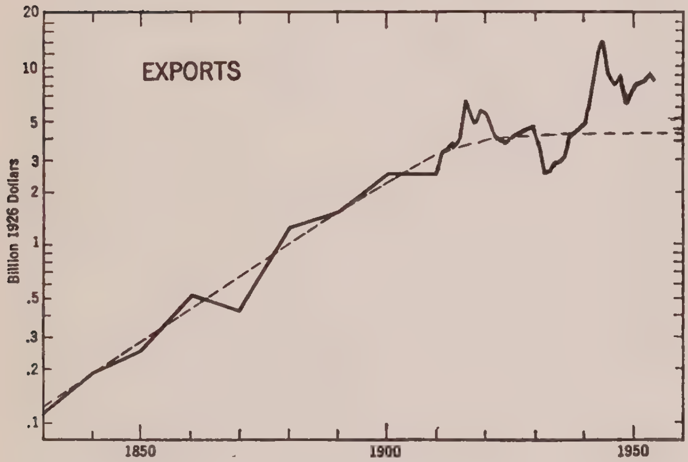


FIG. 2. MERCHANDISE EXPORTS, U. S. A., 1830—1954
RATIO SCALE

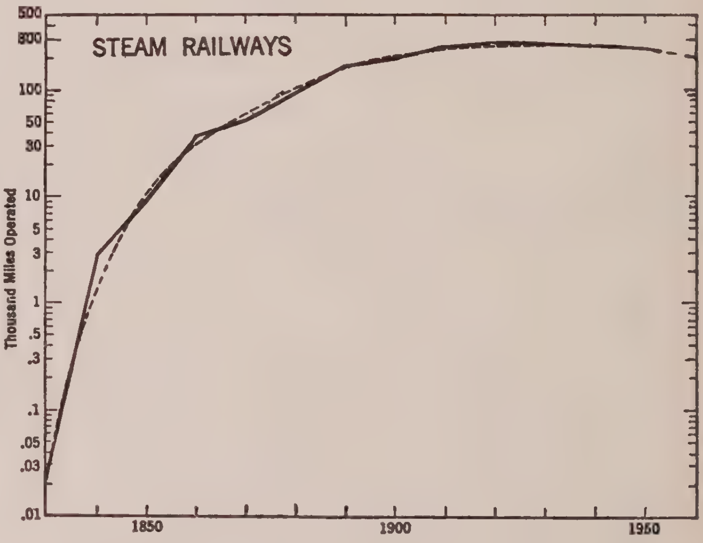


FIG. 5. STEAM RAILWAYS MILES OF FIRST TRACK OPERATED, U. S. A., 1830—1953. RATIO SCALE

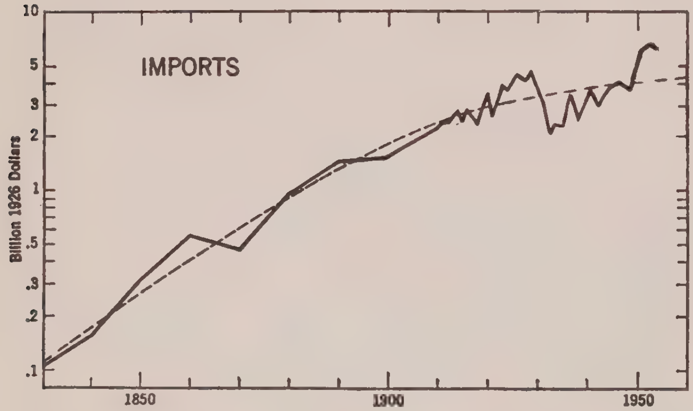


FIG. 3. MERCHANDISE IMPORTS, U. S. A., 1830—1954
RATIO SCALE

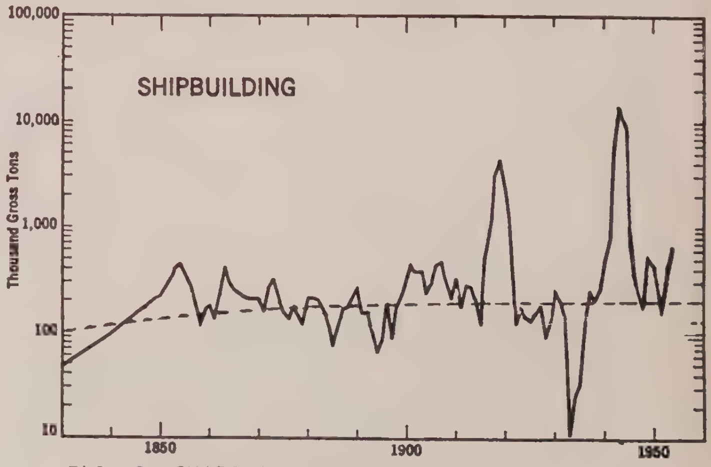


FIG. 6. SHIPBUILDING, U. S. A. 1830—1953
RATIO SCALE

PLATE V

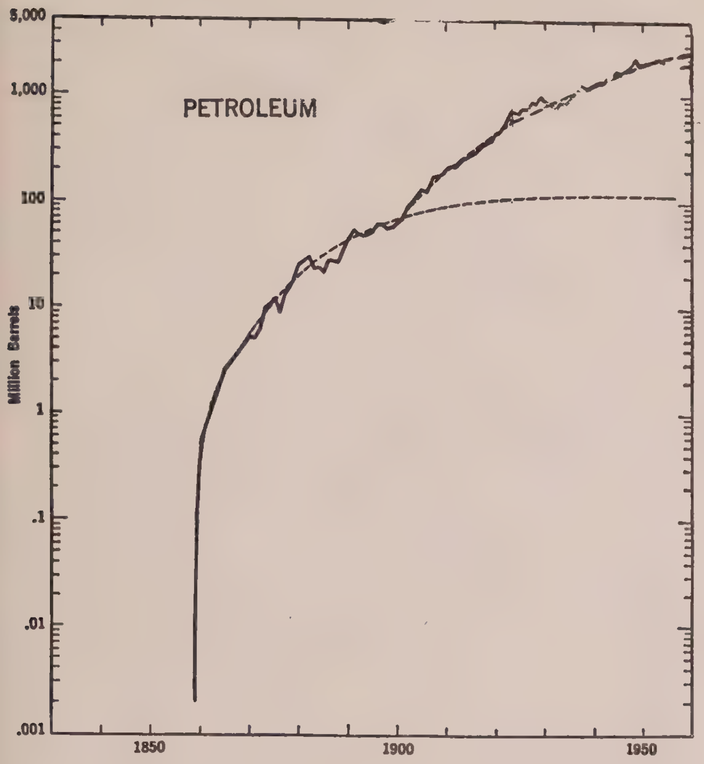


FIG. 1. PETROLEUM PRODUCTION, U. S. A., 1859—1954
THE CURVES REALLY REPORT TWO INDUSTRIES, FIRST, THE ILLUMINATING-OIL INDUSTRY UPON WHICH WAS ALSO SUPERIMPOSED THE MOTOR-FUEL INDUSTRY.

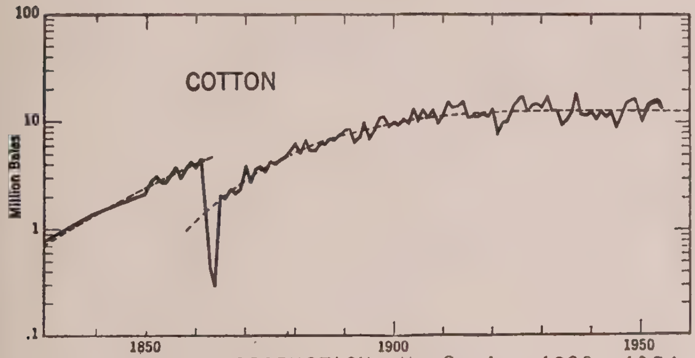


FIG. 2. COTTON PRODUCTION, U. S. A., 1830—1954
NOTE DEVASTATING EFFECTS OF CIVIL WAR.

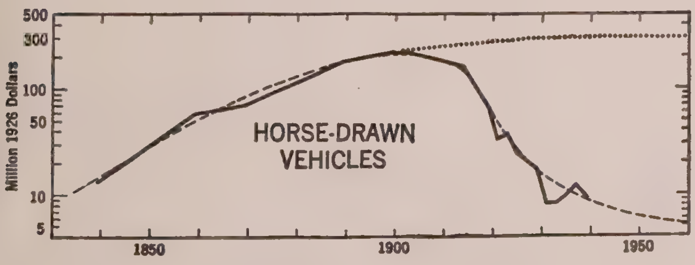


FIG. 3. HORSE-DRAWN VEHICLE PRODUCTION, U. S. A., 1839—1939
NOTE DECAY OF THIS INDUSTRY BEGINNING IN 1900 WITH THE ADVENT OF MOTOR VEHICLES. RATIO SCALE

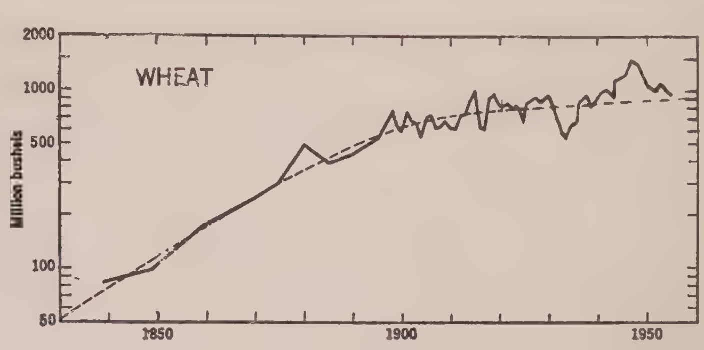


FIG. 4. WHEAT PRODUCTION, U. S. A., 1839—1954
RATIO SCALE

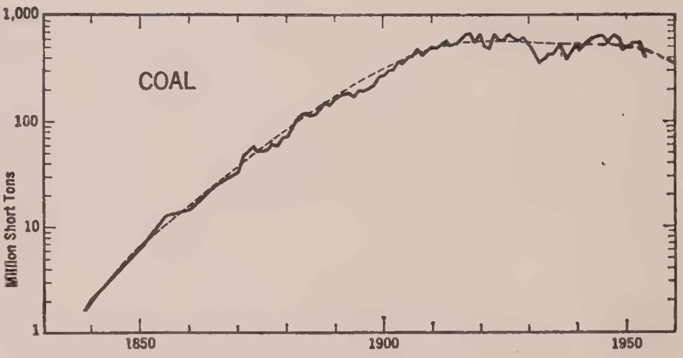


FIG. 5. COAL PRODUCTION, U. S. A., 1840—1954
RATIO SCALE

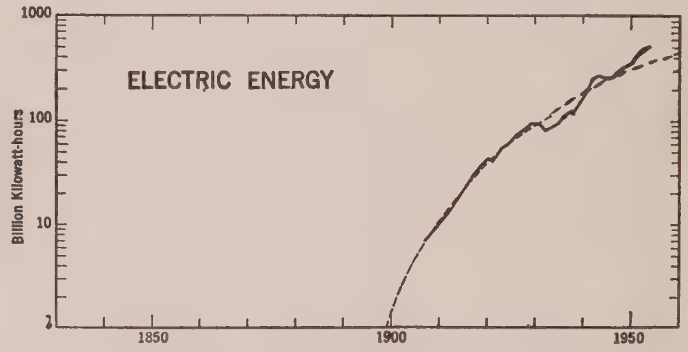


FIG. 6. ELECTRIC ENERGY, U. S. A., 1907—1953
RATIO SCALE

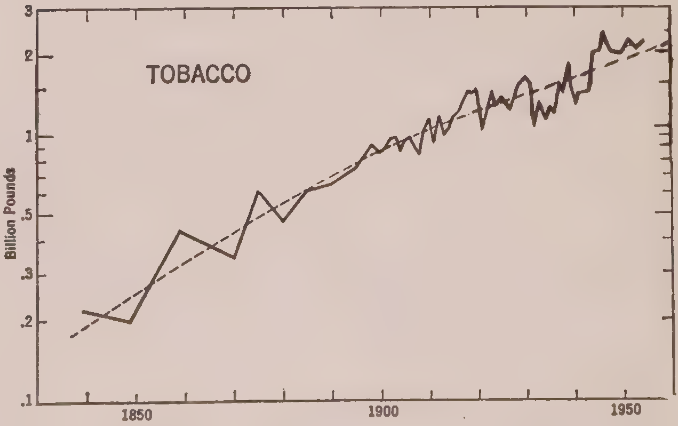


FIG. 7. TOBACCO PRODUCTION, U. S. A., 1839—1954
RATIO SCALE

PLATE VI

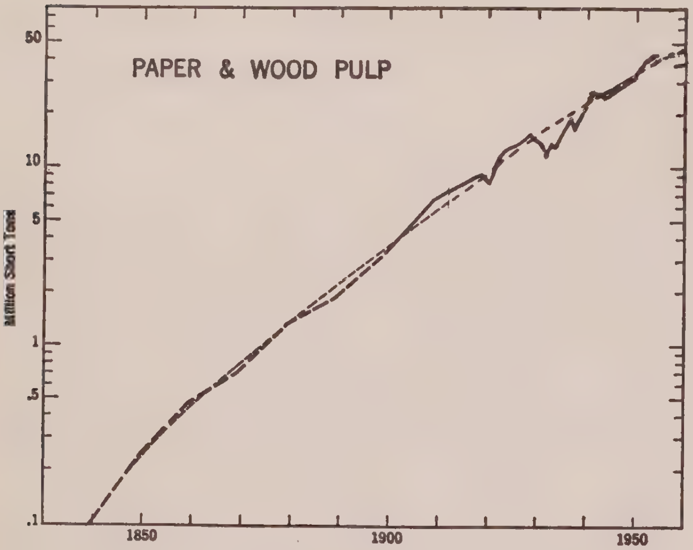


FIG. 1. PAPER AND WOOD PULP, U. S. A., 1839—1954
RATIO SCALE

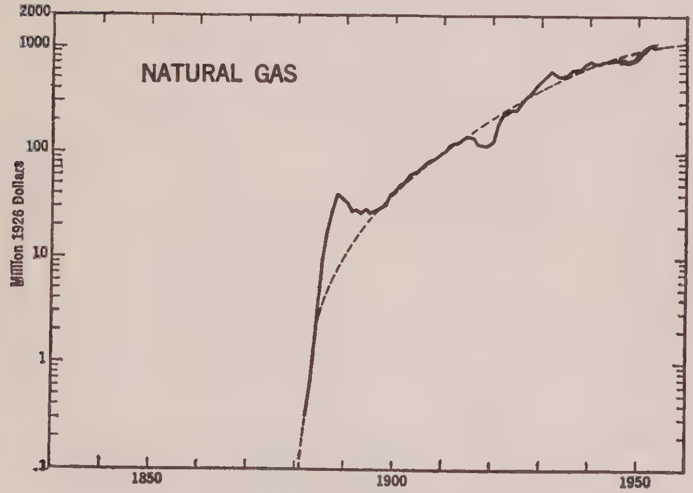


FIG. 2. NATURAL GAS PRODUCTION, U. S. A., 1882—1953 RATIO SCALE

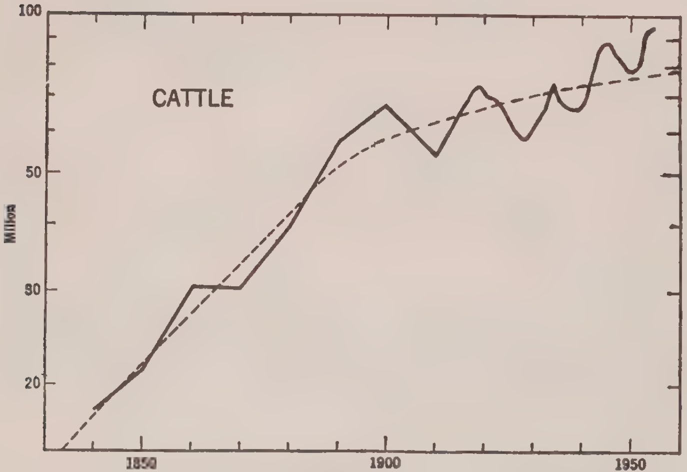


FIG. 3. CATTLE ON FARMS, U. S. A., 1840—1955
RATIO SCALE

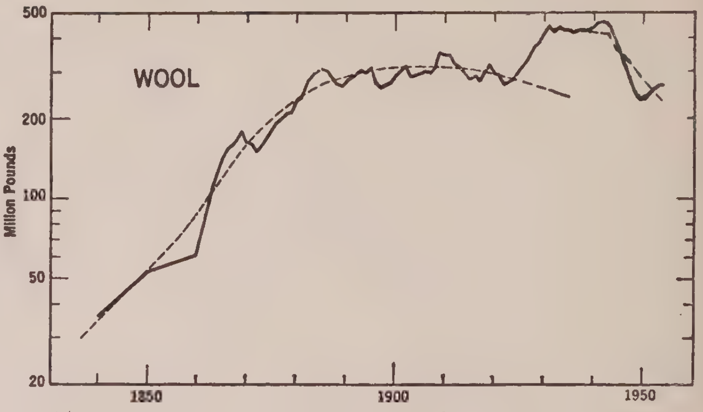


FIG. 4. WOOL PRODUCTION, U. S. A., 1840—1954
RATIO SCALE

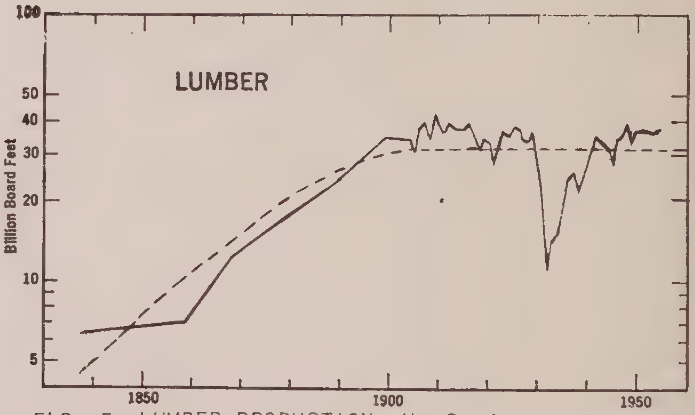


FIG. 5. LUMBER PRODUCTION, U. S. A., 1839—1954
RATIO SCALE

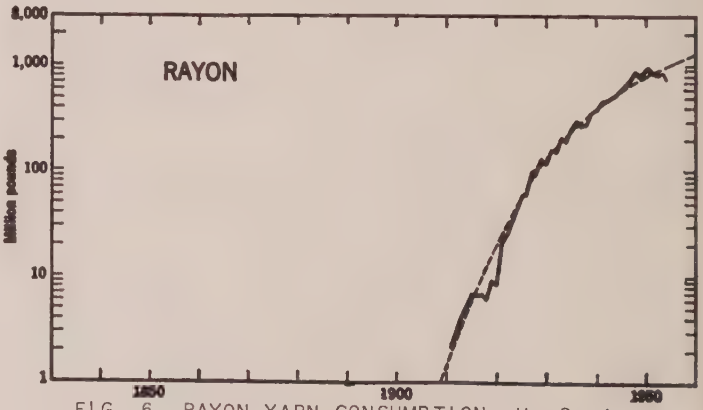


FIG. 6. RAYON YARN CONSUMPTION, U. S. A.,
1911—1954 RATIO SCALE

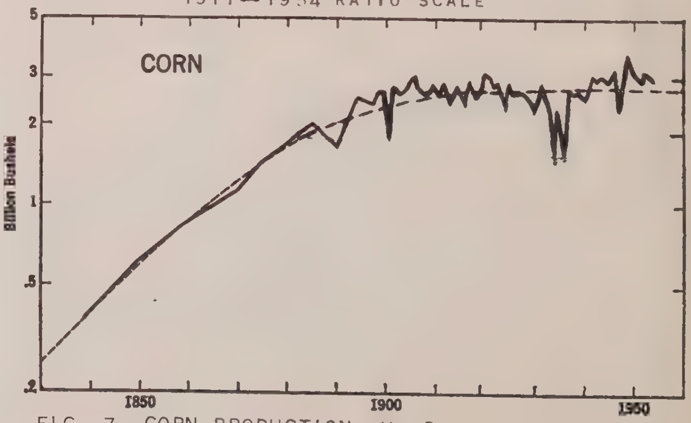


FIG. 7. CORN PRODUCTION, U. S. A., 1839—1954
RATIO SCALE

PLATE VII

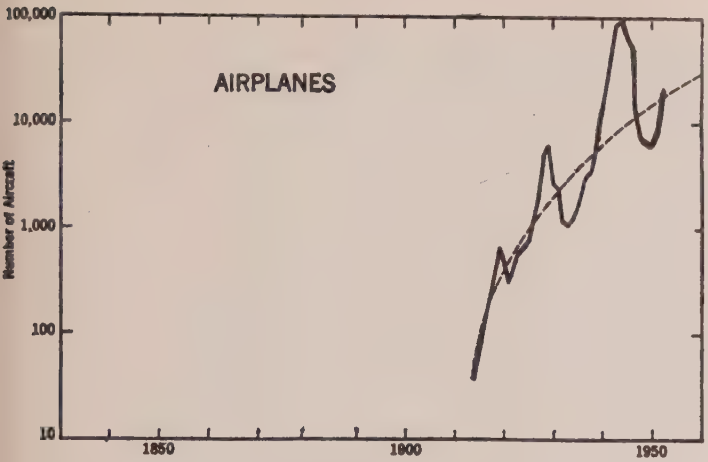


FIG. 1. AIRCRAFT PRODUCTION, U. S. A., 1914—1952 RATIO SCALE

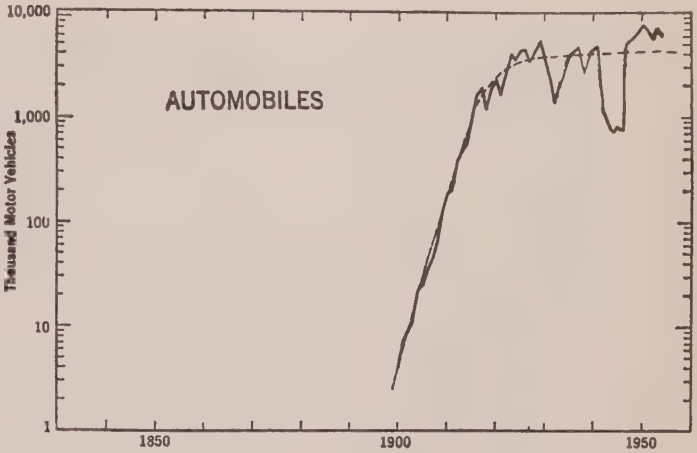


FIG. 4. AUTOMOBILE PRODUCTION, U. S. A., 1900— 1954. RATIO SCALE

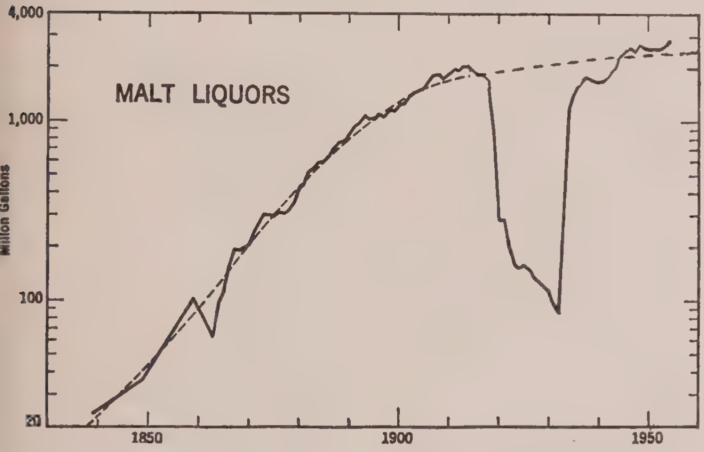


FIG. 2. MALT LIQUOR, U. S. A., 1839—1954 CONSUMPTION 1839—1920 PRODUCTION 1921—1954. NOTE THE EFFECT OF PROHIBITION. RATIO SCALE

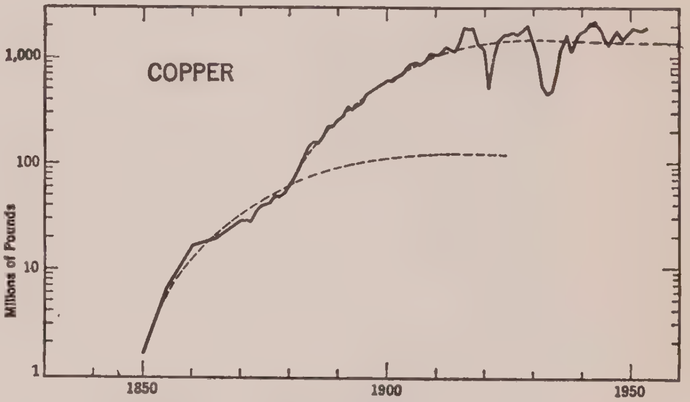


FIG. 5. SMELTER COPPER PRODUCTION, U. S. A., 1850—1953. NOTE COMPOUND GROWTH CURVE, REBIRTH COINCIDING WITH BEGINNING OF ELECTRICAL INDUSTRY. RATIO SCALE

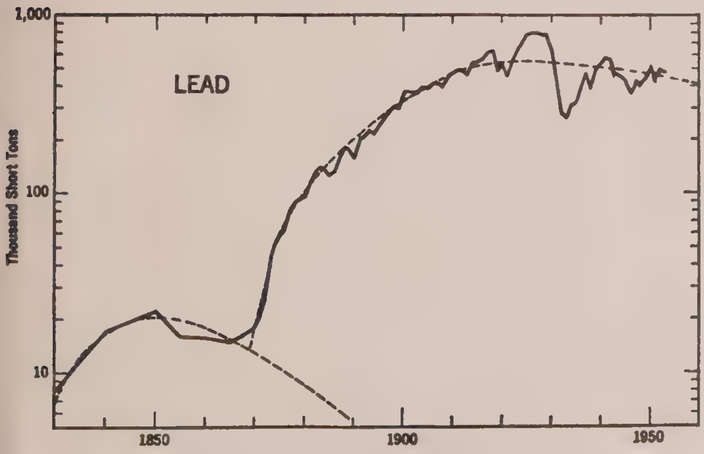


FIG. 3. REFINED PRIMARY LEAD PRODUCTION, U. S. A., 1830—1953. NOTE REBIRTH IN 1869 COINCIDING WITH THE JUNCTION OF THE UNION PACIFIC AND CENTRAL PACIFIC TRACKS, AN EVENT WHICH MADE WESTERN LEAD ORES MARKETABLE. RATIO SCALE

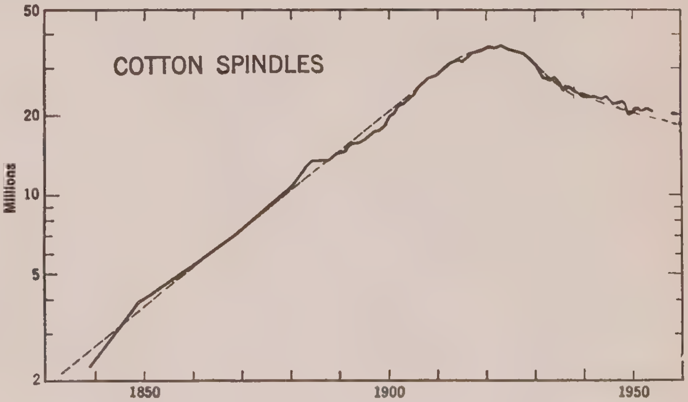


FIG. 6. COTTON SPINDLES IN OPERATION, U. S. A. 1839—1954. RATIO SCALE

PLATE VIII

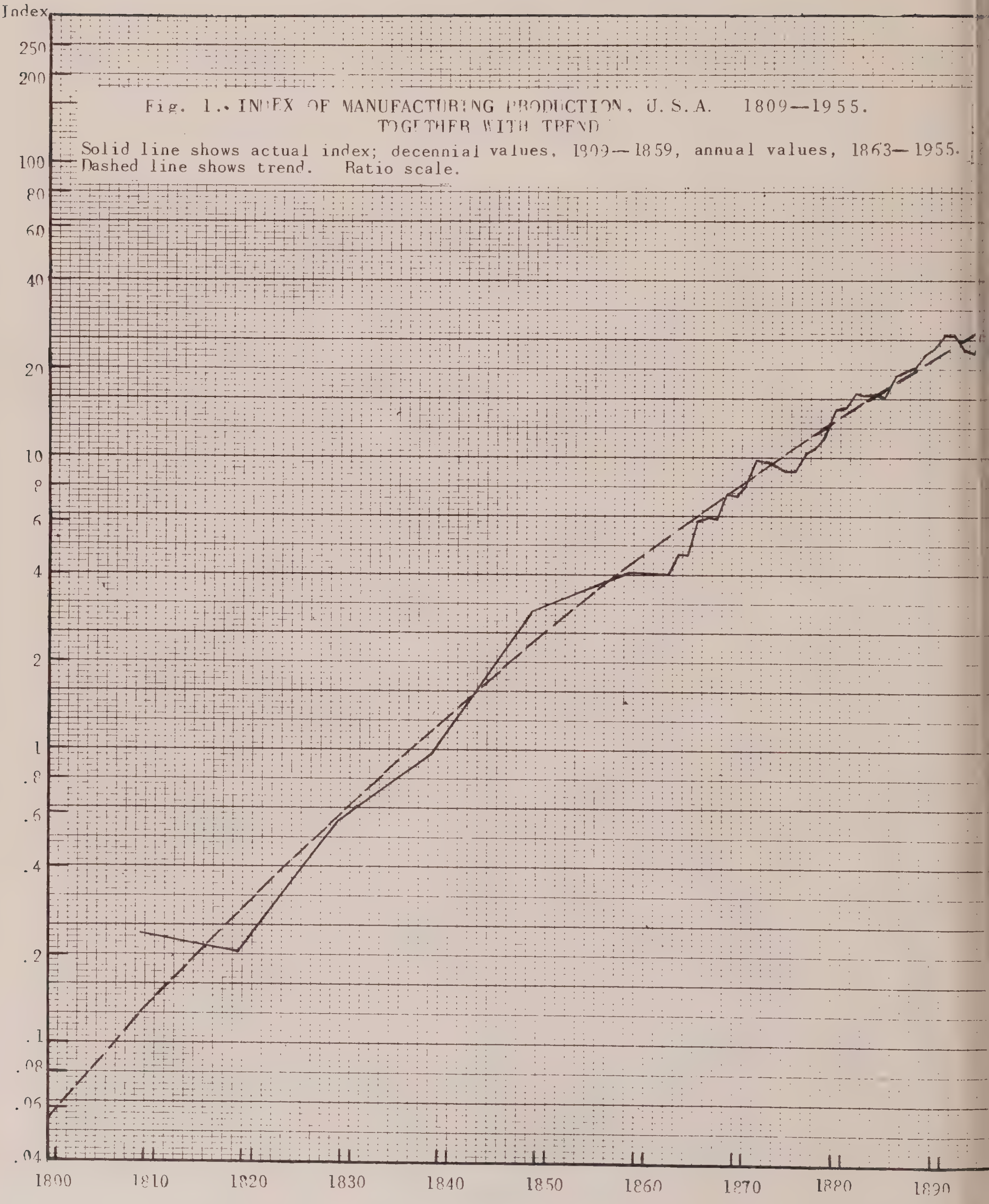
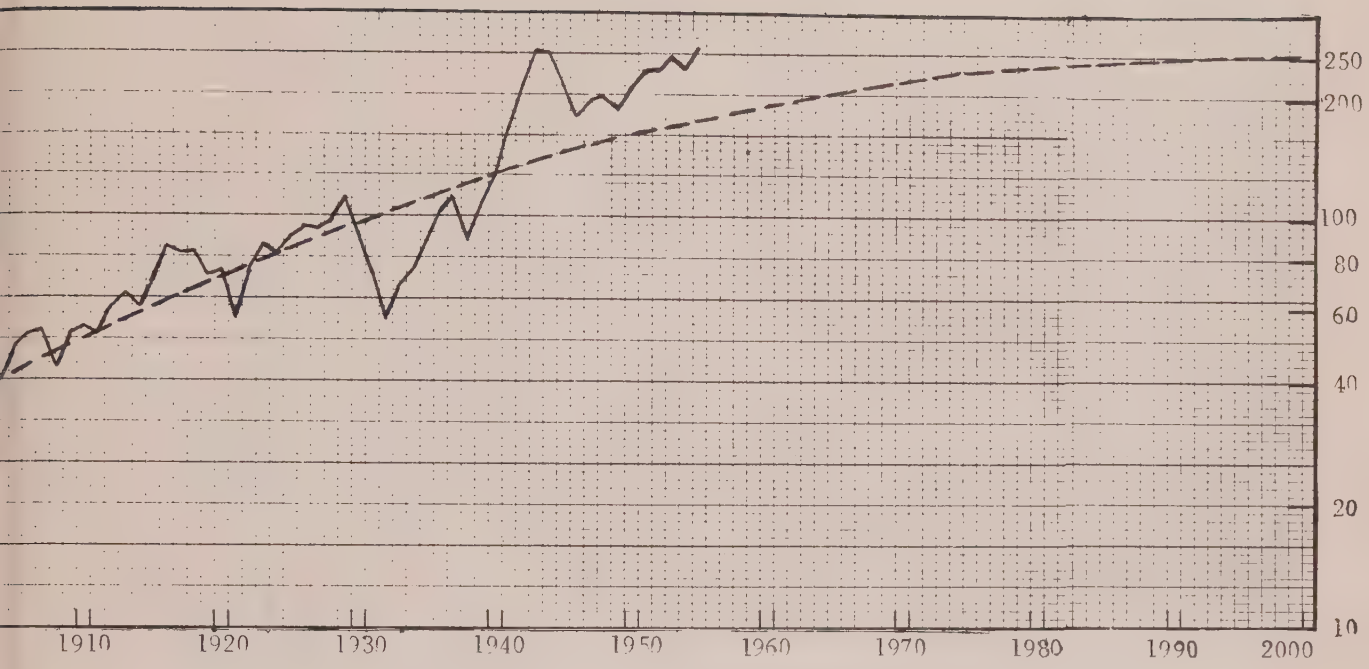


Fig. 1. INDEX OF MANUFACTURING PRODUCTION, U.S.A. 1809—1955. TOGETHER WITH TREND

Solid line shows actual index; decennial values, 1809—1859, annual values, 1863—1955. Dashed line shows trend. Ratio scale.



INDEX OF MANUFACTURING PRODUCTION

Index, Underlying Growth Trend, Rate of Growth, & Percentage above or below Trend

1935-39 = 100

Year	Index	Trend	% Trend Growth for Decade	% Index of Trend	Year	Index	Trend	% Trend Growth for Decade	% Index of Trend	Year	Index	Trend	% Trend Growth for Decade	% Index of Trend
1799		.054			1892	26.1	24.27		108	1928	99.	91.83		108
1809	.24	.124	129.7	194	1893	23.1	25.53		90	1929	110.	94.62	36.8	116
1819	.21	.274	120.0	75	1894	22.7	26.85		85	1930	90.	97.27		93
1829	.56	.59	110.7	95	1895	27.6	27.86		99	1931	74.	100.00		74
1839	.99	1.19	101.8	83	1896	25.3	28.97		87	1932	57.	103.04		55
1849	3.0	2.30	93.2	130	1897	28.5	30.06		95	1933	68.	105.93		64
1859	4.0	4.26	85.1	94	1898	30.8	31.26		99	1934	74.	108.89		68
1863	4.0	5.41		74	1899	32.4	32.43	55.7	100	1935	87.	111.69		78
1864	4.7	5.74		82	1900	33.1	33.81		98	1936	104.	114.55		91
1865	4.6	6.07		76	1901	37.3	35.24		106	1937	113.	117.76		96
1866	6.1	6.41		95	1902	41.8	36.81		114	1938	87.	120.78		72
1867	6.3	6.76		93	1903	42.8	38.37		112	1939	109.	123.88	31.0	88
1868	6.2	7.14		87	1904	40.2	40.00		101	1940	126.	126.77		99
1869	7.5	7.55	77.3	99	1905	48.0	41.59		115	1941	168.	130.02		129
1870	7.4	7.98		93	1906	51.6	43.15		120	1942	212.	133.05		159
1871	8.0	8.43		95	1907	52.2	44.87		116	1943	258.	136.46		189
1872	9.8	8.91		110	1908	43.1	46.56		93	1944	252.	139.64		180
1873	9.6	9.42		102	1909	51.2	48.42	49.1	106	1945	214.	142.56		150
1874	9.4	9.95		94	1910	54.5	50.23		109	1946	177.	145.88		121
1875	9.1	10.47		87	1911	52.2	52.12		100	1947	194.	148.94		130
1876	9.1	11.02		83	1912	60.0	54.20		111	1948	198.	152.41		130
1877	10.3	11.59		89	1913	64.2	56.23		114	1949	183.	155.59	25.5	118
1878	10.7	12.19		88	1914	60.3	58.34		103	1950	217.	158.49		137
1879	11.7	12.82	69.8	91	1915	70.7	60.39		117	1951	232.	161.81		143
1880	14.5	13.49		107	1916	84.0	62.52		134	1952	240.	164.82		146
1881	14.7	14.19		104	1917	83.4	64.57		129	1953	261.	168.27		155
1882	16.6	14.93		111	1918	82.4	66.84		123	1954	243.	171.40		142
1883	16.4	15.70		104	1919	72.0	69.18	42.9	104	1955	268.	174.58		154
1884	16.5	16.52		100	1920	74.	71.45		104	1956		177.42		
1885	15.9	1730		92	1921	56.	73.79		76	1957		180.72		
1886	18.9	18.11		104	1922	74.	76.38		97	1958		183.65		
1887	19.7	19.01		104	1923	86.	78.89		109	1959		187.07	20.2	
1888	20.0	19.91		100	1924	81.	81.47		99	1969		215.28	15.1	
1889	22.3	20.85	62.6	107	1925	90.	83.95		107	1979		237.14	10.3	
1890	23.8	21.93		109	1926	95.	86.50		110	1989		250.61	5.6	
1891	26.0	23.07		113	1927	94.	89.12		105	1999		253.51	1.1	

how small the thing is to start with. If its very small it will merely take a few more years.

The same thing holds true no matter how slowly the thing grows. If it takes a hundred years to double in size you will get the same result, only it will take longer. You just simply can't have anything growing at the same *rate* over any long period of time without getting something so big that it will fill all space.

Of course the rate of growth does not have to get *uniformly* less, interval by interval. I have already given you an example in Germany of a growth trend which started to taper off and which then had a re-birth. With this example in front of them, and other examples from plates V, VI, VII, and VIII, such as lead production in 1850, copper production in 1883, and petroleum production in 1900, many people wonder if our own economy may not be experiencing a rebirth at the present time.

No Rebirth Visible

As best I can determine it, the present spurt is only a spurt. The ten additional years of figures which have become available since *Cycles—The Science of Prediction* was written do not change my opinion, that our economy, in common with all other things that grow, is now growing at a less rapid rate than formerly and will certainly grow at an even less rapid rate in the years to come.

This subject is important enough to justify a few extra words. Just what is our growth rate at the present time and what will it be 5, 10, or 15 years from now?

All Trend Determination Subjective

In answering this question I wish to make it clear that there is no absolute God-given answer. No matter how "scientifically" or "mathematically" a trend is determined, in final analysis a trend is never more than the judgment of the man who computes it.

With this qualification in mind, refer to Plate IX which represents my best guess regarding the underlying growth trend of manufacturing production in this country, 1800—2000. For details regarding this trend refer to *Cycles* for January and for February 1954.

Where We Are and Whats Ahead?

Plate IX is based on the F.R.B. Index of Manufacturing Production, 1935-39 = 100. Underlying growth trend, as determined, will increase about 20% in the 10 years ending 1959. The 10 years ending 1969 will grow at the rate of 15%, and so on, progressively less, until we reach complete maturity about the year 2000.

We are now 54 % above trend as I have determined it. What goes up must come down. If the trend has been correctly determined this fact sounds a note of caution for the future. E.R.D.

A NEW ELECTRONIC CYCLE ANALYZER

By Vedder Hughey

THERE have been many interesting attempts to reduce a chart to a set of regular waves with the aid of mechanical or electronic devices. Figure one diagrams another step along this experimental road. This device was built by the author with the help of Mr. L. C. Green of Buffalo, N. Y., a very expert technician.

Referring to Fig. 1, the upper left hand part shows the photo pick-up unit (1) which converts the curve being analyzed into electrical wave form. This is accomplished by making a silhouette of the curve just long enough to wrap around inside the transparent drum (A). This plastic drum is open at one end and a long bulb with a straight line filament is mounted along the axis. The height of the silhouette of the curve at the point on the drum just in line between the straight filament and a slit in the travelling screen (2) will determine the length of the filament light which will fall on the translucent screen in front of the photo tube. Thus the voltage generated by the photo tube at any instant is proportional to the height of the curve at that point.

The Drum Rotates

As the drum rotates the electric current of the pick-up output will vary as the curve varies. If this output is connected to an oscilloscope (5) and the electron beam of the oscilloscope is made to sweep from left to right at exactly the same speed as the rotating drum, then the 'scope will show a picture of the silhouette, or curve, being analyzed. To achieve this we simply use a synchronous motor to rotate the drum exactly thirty times a second, and set the 'scope to "sweep" at this same rate. Thus, thirty times a second, the 'scope face shows a graph of the series as drawn and presistence of vision makes the picture appear constant.

Curve in Electrical Form

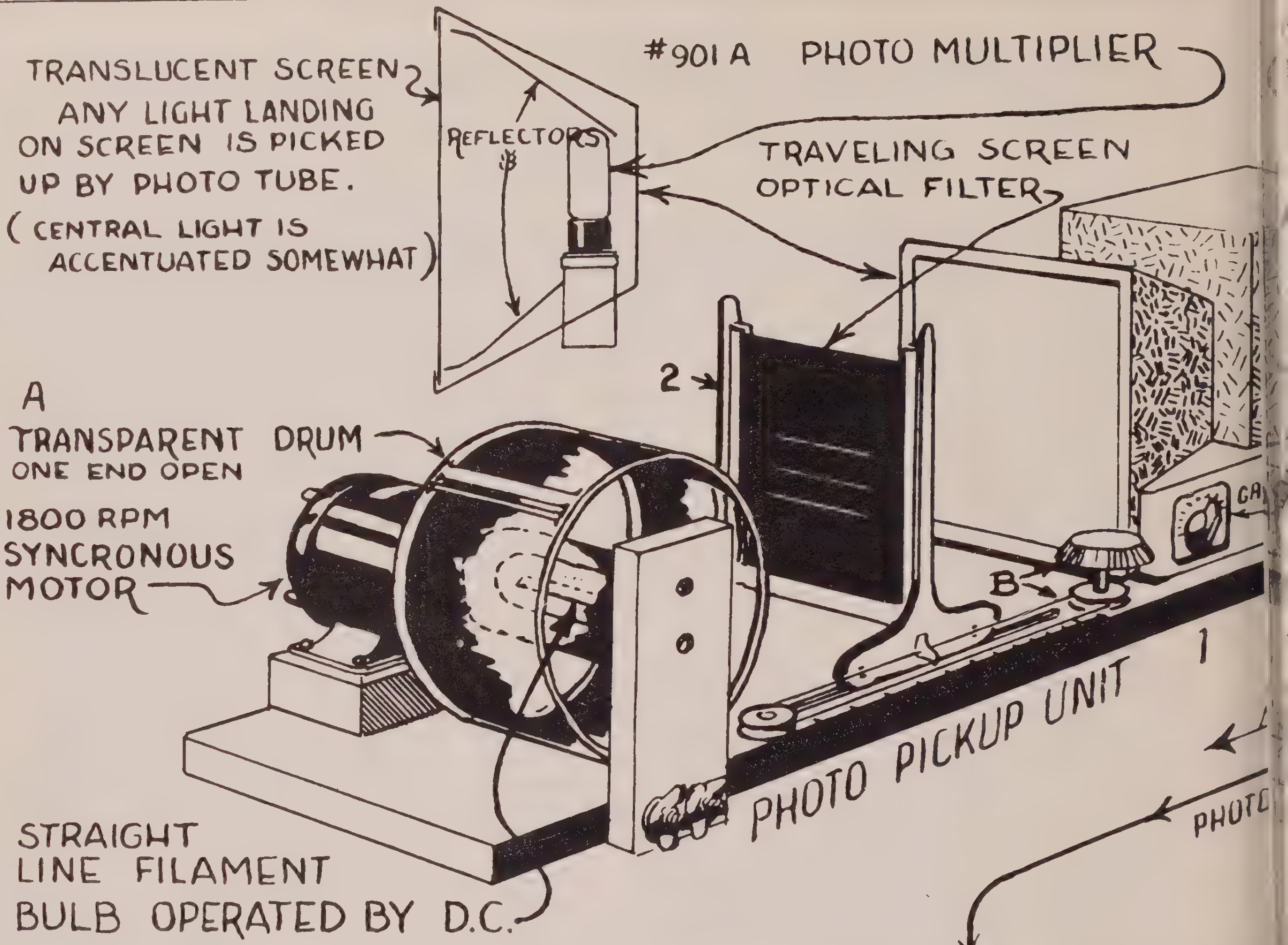
So we have converted our curve into a graph on the oscilloscope face and have, in the photo pick-up output, an electric current which varies exactly as the curve of the series varies. We are assuming that the travelling optical screen (2) has only one slit. I will mention elsewhere some interesting possibilities involving the employment of several slits. Now, if the series can be analyzed electronically, we can do this by putting the photo pick-up current thru the appropriate analyzing devices and interpreting the indications these devices give.

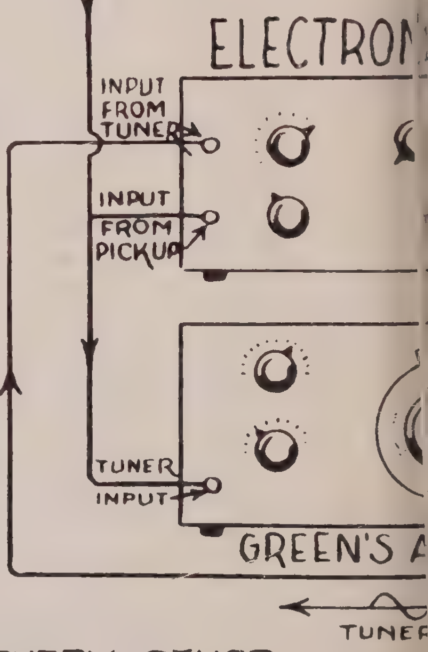
Note that the only way we can do this is to keep rotating the drum and this means that we are repeating the curve in electrical wave form thirty times a second. In terms of the response characteristics of electronic equipment this is repetition only once in a long, long time. Incredible as it sounds to the layman, a thirtieth of a second in electronics is comparable to, say, a million years in the study of geology, as far as the evidence presented is capable of detailed analysis.

The Analysis

And now, with our curve in electrical wave form, how will we analyze it? The first thought is to put this electrical "curve" thru a tuner, like our radio or T. V. tuners, so that only the wave length tuned to can come thru, if there is such a wave length present in the curve being studied. Then we could see the wave present on the monitor 'scope (5). This is exactly what we do, but there are complications. Any wave present in the curve, long enough to be of interest, will be so long, electronically speaking, that ordinary radio tuners cannot cope with it. Such relatively long waves require very special tuning circuits.

The development of these circuits as efficient tuners is in its infancy, at least as compared with tuners for the higher frequencies. However, the author was most fortunate in having a friend, Mr. L. C. Green, who became a collaborator in the design of this analyzer and who developed a low frequency tuner of amazing efficiency. When the pick-up is passed thru Green's tuner (4) and then shown on





INSIDE OF TRANSPARENT DRUM "A", IS WRAPPED A SILOUHETTE OF A TIME SERIES, THE HEIGHT OF THE SERIES AT ANY POINT DETERMINES THE AMOUNT OF LIGHT RECEIVED BY THE PHOTO TUBE.

TRAVELING SCREEN OPTICAL FILTER "2". DISTANCE OF SCREEN FROM LIGHT SOURCE DETERMINES SEPARATION OF THREE ITEMS PICKED UP FROM THE TIME SERIES. A SINGLE SLIT PICKS UP SIMPLY THE GRAPH AS DRAWN.

THE ELECTRONIC SWITCH RECEIVES BOTH THE PICKUP OUTPUT AS WELL AS THIS OUTPUT MODIFIED BY THE TUNER, THE SWITCH OUTPUT PASSES ALTERNATELY EVERY OTHER THIRTIETH OF A SECOND, FIRST ONE THEN THE OTHER TO THE MONITOR OSCILLOSCOPE, ON WHICH BOTH CURVES CAN BE SEEN SIMULTANEOUSLY.

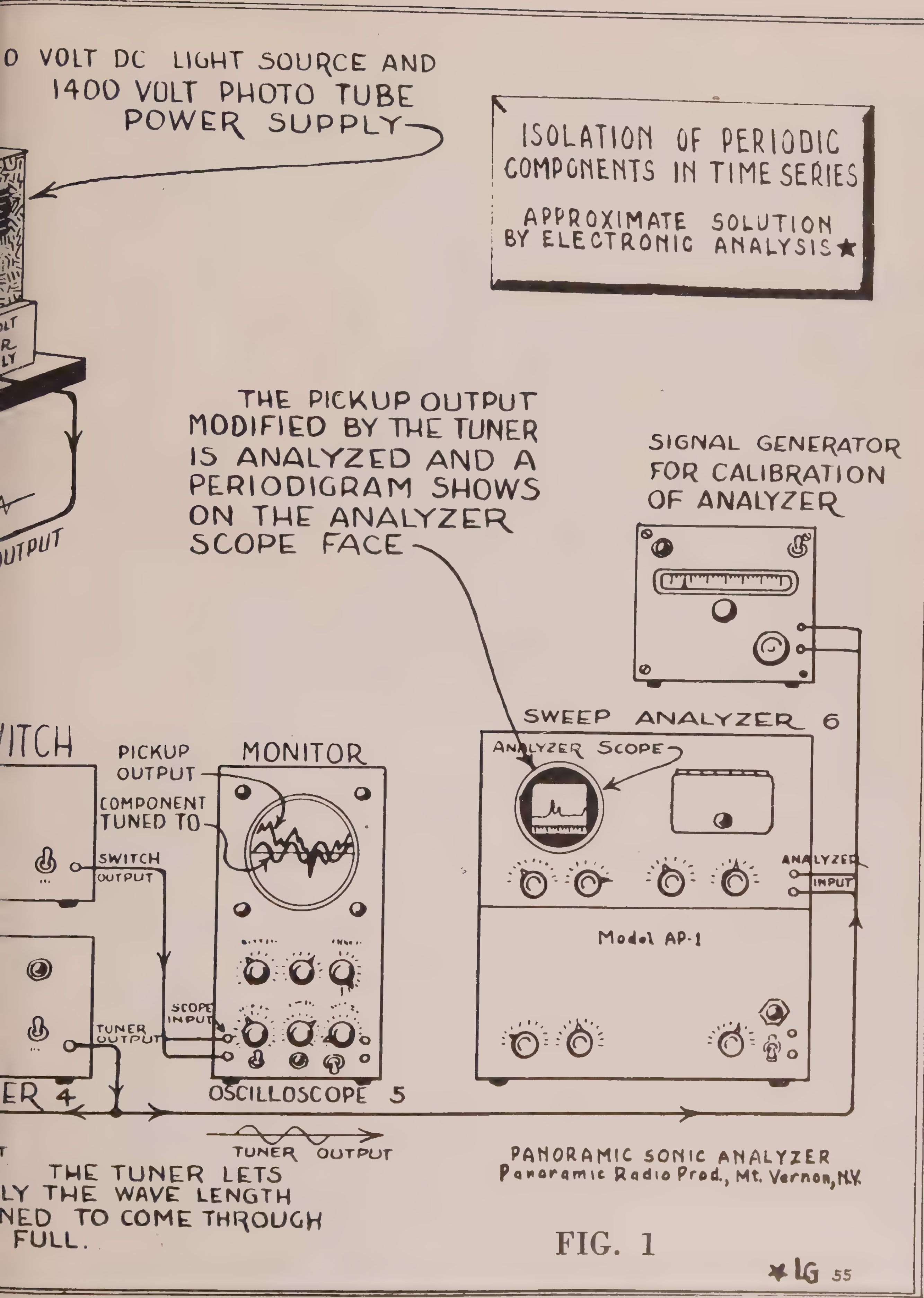

0 VOLT DC LIGHT SOURCE AND
1400 VOLT PHOTO TUBE
POWER SUPPLY
ISOLATION OF PERIODIC COMPONENTS IN TIME SERIES
APPROXIMATE SOLUTION BY ELECTRONIC ANALYSIS★
OLT
R
LY
UTPUT
THE PICKUP OUTPUT MODIFIED BY THE TUNER IS ANALYZED AND A PERIODIGRAM SHOWS ON THE ANALYZER SCOPE FACE
SIGNAL GENERATOR FOR CALIBRATION OF ANALYZER
SWEEP ANALYZER 6
ANALYZER SCOPE
ANALYZER INPUT
Model AP-1
ITCH
PICKUP OUTPUT
COMPONENT TUNED TO
SWITCH OUTPUT
MONITOR
SCOPE INPUT
TUNER OUTPUT
ER 4
OSCILLOSCOPE 5
TUNER OUTPUT
THE TUNER LETS
LY THE WAVE LENGTH
NED TO COME THROUGH
FULL.
PANORAMIC SONIC ANALYZER
Panoramic Radio Prod., Mt. Vernon, N.Y.
★ LG 55

FIG. 1

the monitor 'scope (5) the results are striking. Any wave present and having a length to which the tuner is set for will come thru and show on the monitor 'scope face. Any other wave which may be present but of somewhat longer or shorter length will be very greatly suppressed.

Timing and Strength

When we view the wave we have tuned or filtered out of the curve and onto the monitor 'scope it is hard to tell where the turning points are and what the amplitude (strength) is in relation to the time base and verticle scales of the curve being analyzed. So we conceived the idea of showing both the curve itself and the tuned-to component, together on the same 'scope by switching first one and then the other into the monitor 'scope. This is effected by the electronic switch (4) which, every other thirtieth of a second, passes alternately the pick-up output and the tuner output to the monitor 'scope. This allows us to date the turning points of the tuned component wave by reference to the curve itself, shown simultaneously.

The amplitude or strength of the tuned component (cycle) is found as follows: A control on the tuner is set so that the tuner does no tuning but acts simply as an amplifier with controllable gain or loss. The gain control is then adjusted so that the two curves on the monitor 'scope are identical and merge into one. Now, when the tuning function is introduced again, the amplitude of the component wave as shown on the 'scope will be its correct value as it exists on the average in the curve. The switch, tuner and monitor 'scope are items three, four and five in the drawing.

The Sweep Analyzer

We had hoped that this much apparatus would allow a good approximate analysis of the curve. But trying to read the monitor'scope with any degree of exactness is an almost impossible task, at least with the quality of equipment which we could afford. So we thought of hitching on to the tuner another type of tuner called a sweep analyzer (6). The sweep analyzer is a remarkable piece of equipment commonly used by radio stations and acoustic engineers. It has a viewing 'scope on which a beam sweeps from left to right about once a second. The phosphor of the 'scope face has a high persistence so that what shows lasts just about a second and a permanent picture results. As the 'scope beam sweeps, a comple tuning circuit also sweeps, in its response, over whatever tuning range the sweep tuner is adjusted for. At any instant, if a wave is present in the input of the length the tuner is responding to at that instant, then a verticle pip shows on the sweep tuner's 'scope face with a height proportional to the amplitude of the wave present. Thus the sweep tuner 'scope draws a periodigram of the time series being input.

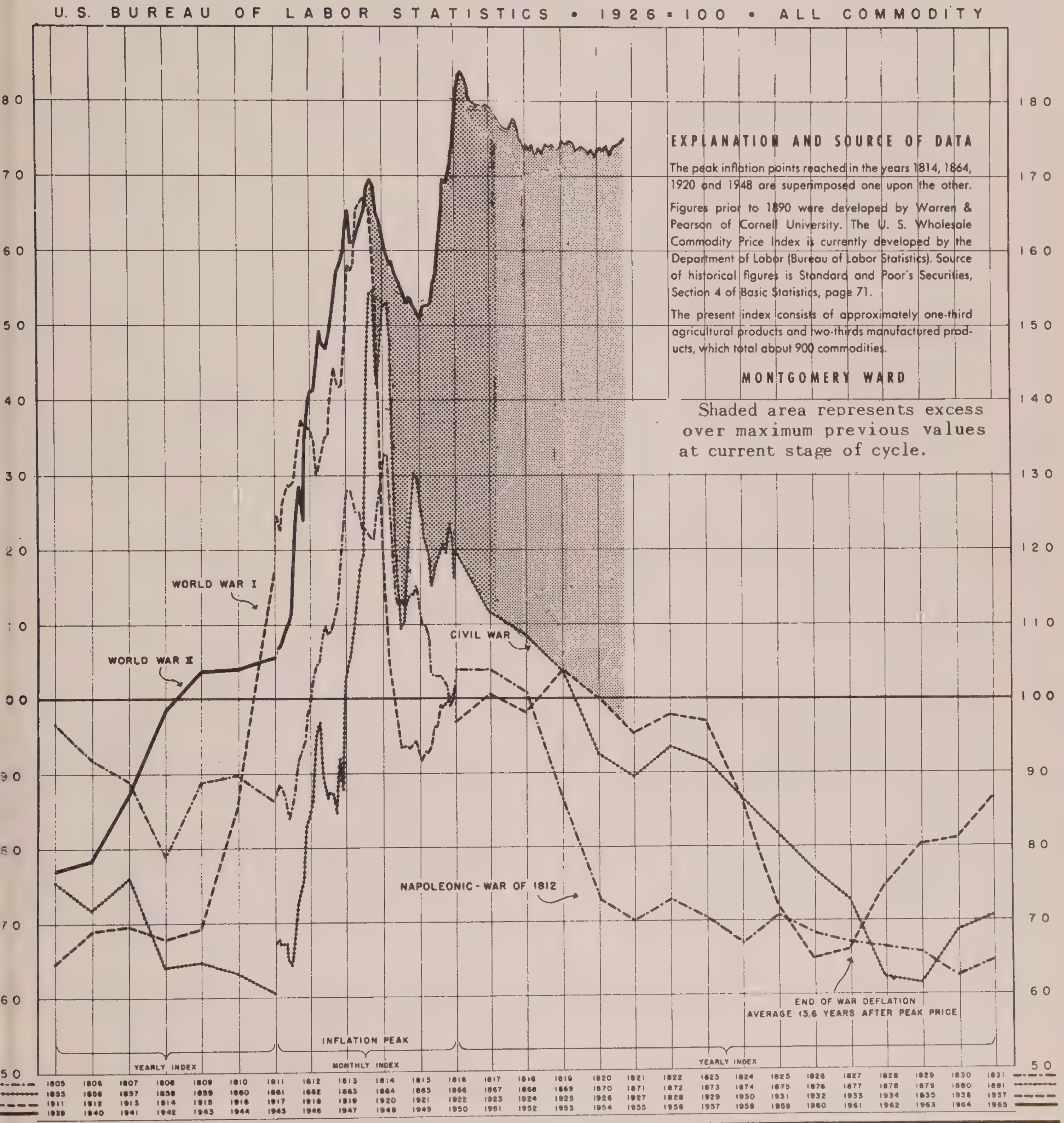
Other researchers have attempted to connect the pick-up output directly to the sweep analyzer but difficulties immediately ensue. Just as Green's tuner, with the electron switch and monitor'scope, do not see quite enough for practical work, so the sweep analyzer is troublesome because it sees too much. Every random and slight deviation of the curve from a smooth curve is reduced to a large number of harmonic components which, as far as cyclical analyzer and forecast value are concerned, are "false" components. Thus the sweep analyzer 'scope face becomes a jumble of "hash," as radio mechanics call it.

The Complete Spectrum

So we conceived a sort of compromise. The output of Green's tuner is a smooth curve containing only waves whose lengths cover a narrow range about the point tuned to. If tuner output is input to the sweep analyzer we have, in effect, given it a nice easy job to do. It will clearly show the waves present with little "hash." And the period lengths and relative amplitudes which may be present can be read directly from the sweep analyzer 'scope face. Working the tuner slowly over the whole range we can progressively examine every part of the spectrum in this way.

There are other theoretical, technical and practical matters in connection with the use of the apparatus which are discussed in a lengthier article to appear in the January 1956 issue of the *Journal of Cycle Research.*

U. S. WHOLESALE COMMODITY PRICE INDEX
MAJOR WAR PERIODS
by **W. R. GEISINGER**



EXPLANATION AND SOURCE OF DATA

The peak inflation points reached in the years 1814, 1864, 1920 and 1948 are superimposed one upon the other.

Figures prior to 1890 were developed by Warren & Pearson of Cornell University. The U. S. Wholesale Commodity Price Index is currently developed by the Department of Labor (Bureau of Labor Statistics). Source of historical figures is Standard and Poor's Securities, Section 4 of Basic Statistics, page 71.

The present index consists of approximately one-third agricultural products and two-thirds manufactured products, which total about 900 commodities.

MONTGOMERY WARD

Shaded area represents excess over maximum previous values at current stage of cycle.

Prices normally go up during wars and for a short time thereafter.

After previous wars prices always declined.

After World War II, however, our government manipulated the currency to keep prices up.

Excess of prices during the past seven years over maximum previous prices after war peaks is shown by the shaded area.

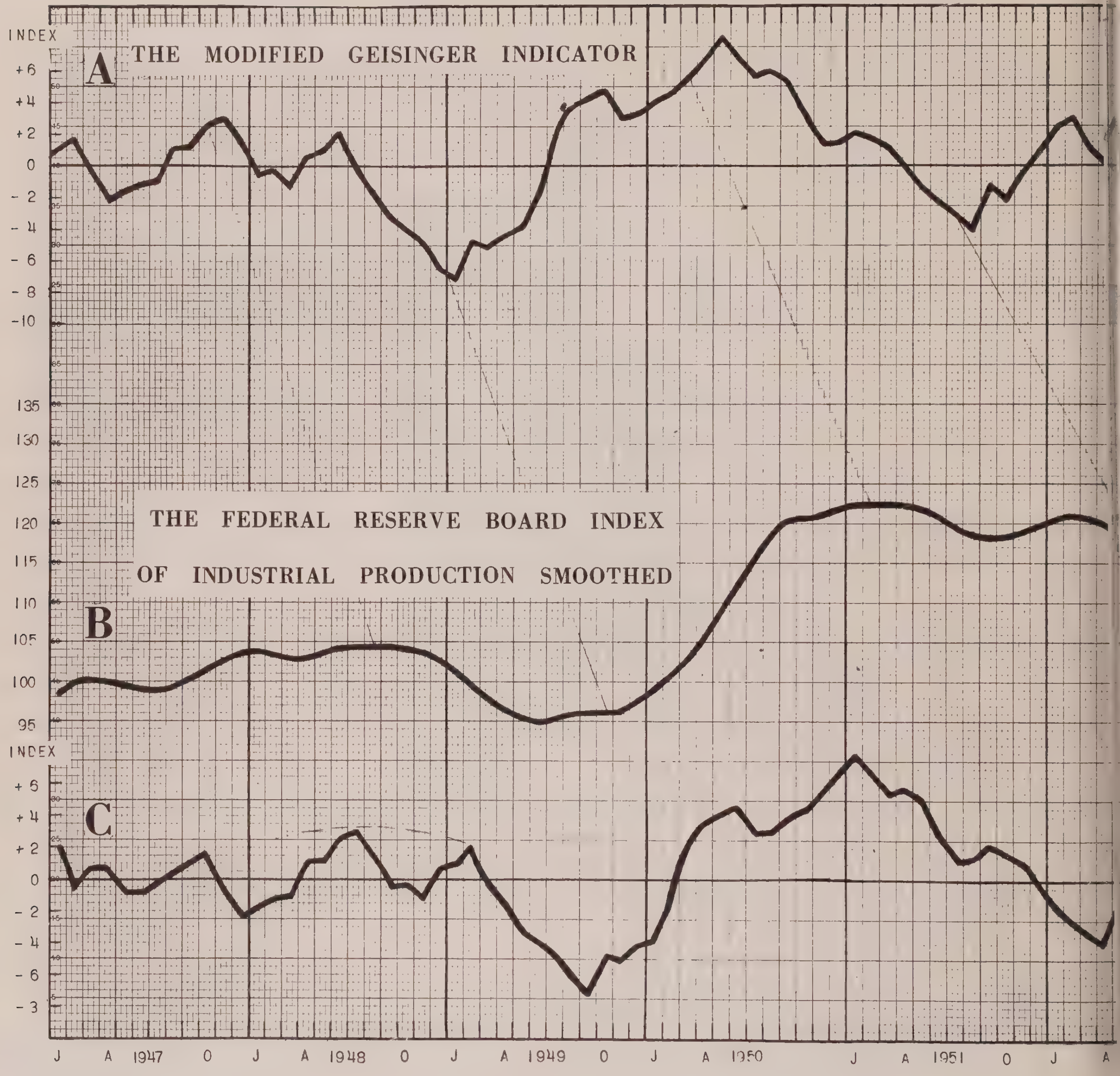
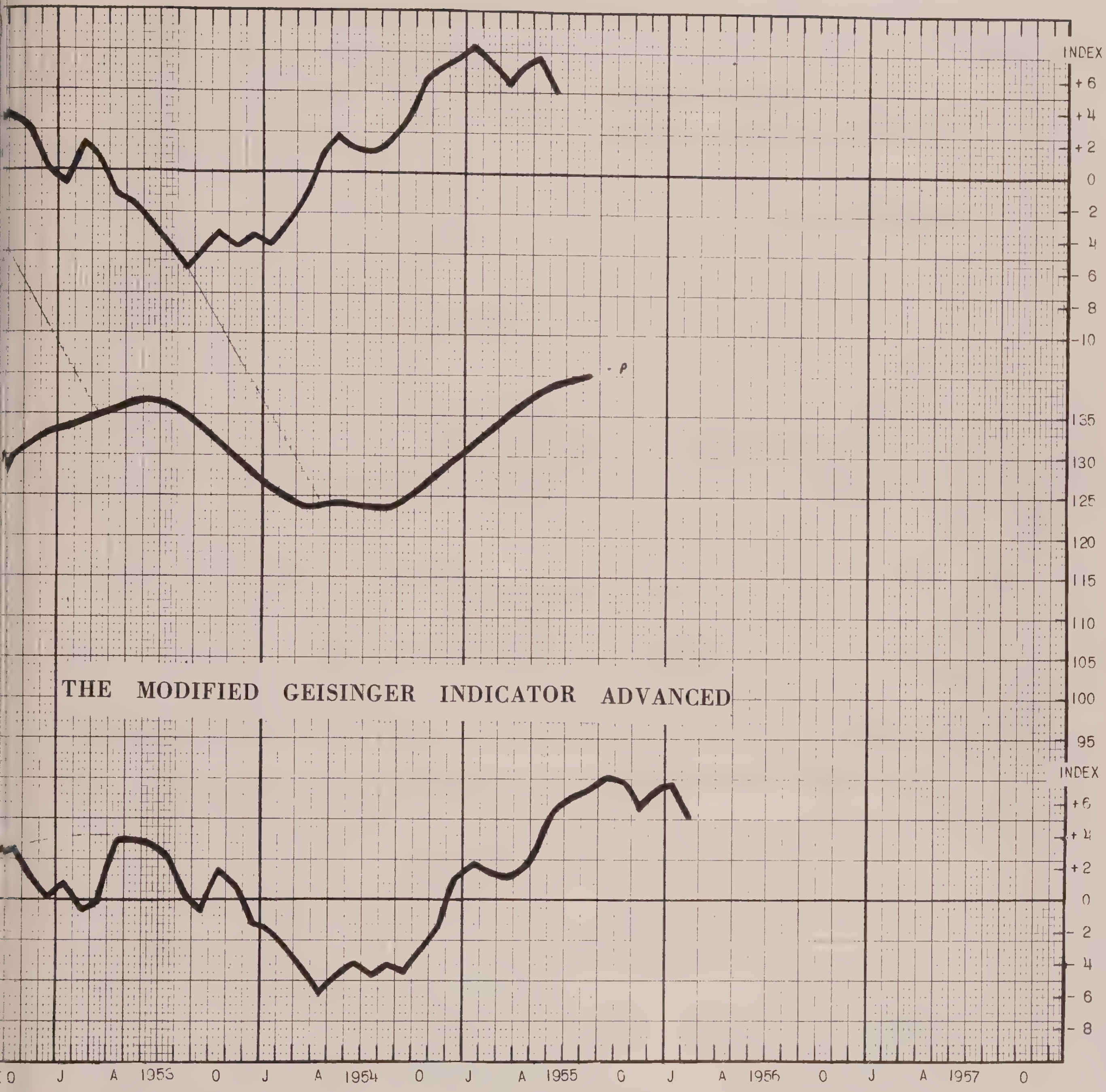


Fig. 1 Curve A. The Modified Geisinger Industrial Production Indicator Curve. This curve is derived from certain figures which are published monthly in the *Survey of Current Business*. It tends to turn about 8 months before the Federal Reserve Board Index of Industrial Production.

Curve B. The Federal Reserve Board Index of Industrial Production adjusted for seasonal variation and smoothed by a 3-month moving average. The value for the latest available month is shown by a dot.

Curve C. This curve is the Modified Geisinger Industrial Production Indicator Curve advanced by 8 months. This process projects part of the curve into the future. If the relationships of the past continue, the projection gives some hint of what may happen to the Federal Reserve Board Index of Industrial Production (Curve B).

OF INDUSTRIAL PRODUCTION



THE FORECAST

The final figure for June (which, when projected, becomes February 1956) is 5. This figure is down 2.2 points from the value of 7.2 for May.

The indicator looks as if it might be topping out, doesn't it? It is now five months since the crest of January 1955. None of the other "false" declines (Feb.—April 1947; Oct. '49—Nov. '49; Feb. '52—June '52) took so long to reach their low point. Also, the rise which began in March and ended in May failed to get anywhere.

The indicator is still very strong (5), but to my way of thinking it is trying to tell us to be cautious in respect to 1956. E.R.P.

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